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THE

EXECUTIVE DOCUMENTS

OF THE

HOUSE OF REPRESENTATIVES

FOR THE

SECOND SESSION OF THE FORTY-NINTH CONGRESS.

1886-'87

IN TWENTY-EIGHT VOLUMES.

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49TH CONGRESS, 2d Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. 31, Part 2.

REPORT

OF THE

TESTS OF METALS

AND

OTHER MATERIALS

FOR

INDUSTRIAL PURPOSES

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL, MASSACHUSETTS,

DURING

THE YEAR ENDED JUNE 30, 1886.

IN TWO PARTS.

PART II.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1889.

SPECIMENS FROM WHITWORTH STEEL JACKET

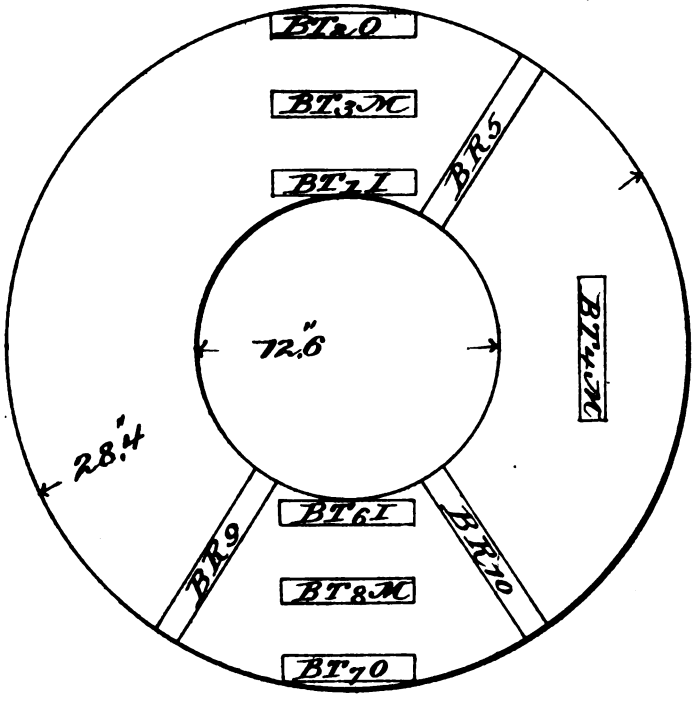
FOR

10-INCH STEEL B. L. RIFLE NO. 1.

10" Steel B.L. Rifle No. 1.

Jacket

Breech end



H Ex 31 492

PECIMENS FROM WHITWORTH STEEL JACKET FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. 2652.

Marks, $\frac{10\ R,\ J}{B\ T,\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000433	.000100	0.	.....	
5,000	20,000	.000633	.000200	0.	.....	
6,250	25,000	.000767	.000134	0.	.....	
7,500	30,000	.000967	.000200	0.	.....	
8,750	35,000	.001167	.000200	.....	.....	
9,000	36,000	.001233	.000066	.....	.....	
9,250	37,000	.001267	.000034	.....	.....	
9,500	38,000	.001333	.000066	.....	.....	
9,750	39,000	.001367	.000034	.....	.....	Elastic limit.
10,000	40,000	.001500	.000133	.....	.....	
10,250	41,000	.001600	.000100	.....	.....	
10,500	42,000	.001667	.000067	.....	.....	
10,750	43,000	.001767	.000100	.....	.....	
11,000	44,000	.001900	.000133	.....	.....	
11,250	45,000	.002033	.000133	.....	.....	
11,500	46,000	.002267	.000234	.....	.....	
11,750	47,000	.002500	.000233	.....	.....	
12,000	48,000	.002933	.000433	.....	.....	
12,250	49,000	.003300	.000367	.....	.....	
12,500	50,000	.004167	.000867	.....	.....	
12,750	51,000	.004500	.000333	.....	.....	
13,000	52,000	.005267	.000767	.....	.....	
13,250	53,000	.005933	.000666	.....	.....	
13,500	54,000	.006833	.000900	.....	.....	
13,750	55,000	.007667	.000834	.....	.....	
14,000	56,000	.008433	.000766	.....	.....	
14,250	57,000	.009333	.000900	.....	.....	
14,500	58,000	.010033	.000700	.....	.....	
14,750	59,000	.010833	.000800	.....	.....	
15,000	60,000	.011767	.000934	.....	.....	
15,500	62,000	.013500	.001733	.....	.....	
16,000	64,000	.015500	.002000	.....	.....	
16,500	66,000	.017333	.001833	.....	.....	
17,000	68,000	.019400	.002067	.....	.....	
17,500	70,000	.021667	.002267	.....	.....	
18,000	72,000	.023967	.002300	.....	.....	
18,500	74,000	.026500	.002533	.....	.....	
19,000	76,000	.029167	.002667	.....	.....	
19,500	78,000	.032333	.003166	.....	.....	
20,000	80,000	.035333	.003000	.....	.....	
20,500	82,000	.0400	.004667	.....	.....	
21,000	84,000	.0433	.0033	.....	.....	
21,500	86,000	.0500	.0067	.....	.....	
22,000	88,000	.0567	.0067	.....	.....	
22,500	90,000	.0667	.0100	.....	.....	
23,000	92,000	.0733	.0066	.....	.....	
23,500	94,000	.1000	.0267	.....	.....	
23,640	94,560	.1233	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,560
Elastic limit per square inch of original section (not well defined)	do...	39,000
Elongation per inch after rupture	inch..	0.1233
Elongation per inch under strain at elastic limit	do...	.001367
Reduction in diameter at point of rupture	do...	.054
Reduction in area after rupture, per centum of original section		18.3
Position of rupture		".35 from neck
Character of broken surface		granular
Elongation of inch sections		".17*, ".08, ".12

No. 2653.

Marks, $\frac{10\ R,\ J}{B\ T,\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000400	.000233	0.	.....	
3,750	15,000	.000600	.000200	0.	.....	
5,000	20,000	.000767	.000167	0.	.....	
6,250	25,000	.000967	.000200	0.	.....	
7,500	30,000	.001167	.000200	0.	.....	
8,750	35,000	.001333	.000166	.....	.....	
9,000	36,000	.001367	.000034	.....	.....	
9,250	37,000	.001400	.000033	.....	.....	
9,500	38,000	.001433	.000033	.....	.....	
9,750	39,000	.001467	.000034	.....	.....	
10,000	40,000	.001533	.000066	.....	.....	
10,250	41,000	.001567	.000034	.....	.....	
10,500	42,000	.001667	.000100	.....	.....	
10,750	43,000	.001733	.000066	.....	.....	
11,000	44,000	.001767	.000034	.....	.....	
11,250	45,000	.001833	.000066	.....	.....	Elastic limit.
11,500	46,000	.001967	.000134	.....	.....	
11,750	47,000	.002033	.000066	.....	.....	
12,000	48,000	.002133	.000100	.....	.....	
12,250	49,000	.002233	.000100	.....	.....	
12,500	50,000	.002433	.000200	.000700	.000700	
12,750	51,000	.002633	.000200	.....	.....	
13,000	52,000	.003000	.000367	.....	.....	
13,250	53,000	.003633	.000633	.....	.....	
13,500	54,000	.004433	.000800	.....	.....	
13,750	55,000	.005332	.000900	.....	.....	
14,000	56,000	.006400	.001067	.....	.....	
14,250	57,000	.007400	.001000	.....	.....	
14,500	58,000	.008400	.001000	.....	.....	
14,750	59,000	.009433	.001033	.....	.....	
15,000	60,000	.010667	.001234	.....	.....	
15,500	62,000	.012733	.002066	.....	.....	
16,000	64,000	.014900	.002167	.....	.....	
16,500	66,000	.017067	.002167	.....	.....	
17,000	68,000	.019400	.002333	.....	.....	
17,500	70,000	.021733	.002333	.....	.....	
18,000	72,000	.024833	.003100	.....	.....	
18,500	74,000	.027667	.002834	.....	.....	
19,000	76,000	.0300	.002333	.....	.....	
19,500	78,000	.0333	.0033	.....	.....	
20,000	80,000	.0367	.0034	.....	.....	
20,500	82,000	.0400	.0033	.....	.....	
21,000	84,000	.0467	.0067	.....	.....	
21,500	86,000	.0533	.0066	.....	.....	
22,000	88,000	.0667	.0034	.....	.....	
22,500	90,000	.0767	.0100	.....	.....	
22,810	91,240	.1067	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,240
Elastic limit per square inch of original section (approximate)	do...	45,000
Elongation per inch after rupture	inch..	0.1800
Elongation per inch under strain at elastic limit	do...	.001833
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		".65 from neck
Character of broken surface		silky
Elongation of inch sections		".14, ".30*, ".10

No. 2654.

18, $\frac{10\ R, J}{B\ T, M}$
ieter, ″.564.
onal area, .25 square inch.

lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000200	.000200	.000033	.000033	
10,000	.000400	.000200	.000033	0.	
15,000	.000567	.000167	.000033	0.	
20,000	.000700	.000133	.000033	0.	
25,000	.000900	.000200	.000067	.000034	
30,000	.001067	.000167	.000067	0.	
31,000	.001133	.000066	.....	.....	
32,000	.001167	.000034	.....	.....	
33,000	.001200	.000033	.....	.....	
34,000	.001267	.000067	.....	.....	Elastic limit.
35,000	.001500	.000233	.000267	.000200	
36,000	.001600	.000100	.....	.....	
37,000	.001700	.000100	.....	.....	
38,000	.001800	.000100	.....	.....	
39,000	.002000	.000200	.....	.....	
40,000	.002333	.000333	.....	.....	
41,000	.002667	.000334	.....	.....	
42,000	.003367	.000700	.....	.....	
43,000	.004067	.000700	.....	.....	
44,000	.004733	.000666	.....	.....	
45,000	.005367	.000634	.....	.....	
46,000	.006167	.000800	.....	.....	
47,000	.007067	.000900	.....	.....	
48,000	.008167	.001100	.....	.....	
49,000	.009067	.000900	.....	.....	
50,000	.009833	.000766	.....	.....	
52,000	.011500	.001667	.....	.....	
54,000	.013667	.002167	.....	.....	
56,000	.015400	.001733	.....	.....	
58,000	.017500	.002100	.....	.....	
60,000	.019700	.002200	.....	.....	
62,000	.022333	.002633	.....	.....	
64,000	.025000	.002667	.....	.....	
66,000	.027667	.002667	.....	.....	
68,000	.030667	.003000	.....	.....	
70,000	.034067	.003400	.....	.....	
72,000	.038333	.004266	.....	.....	
74,000	.0433	.004967	.....	.....	
76,000	.0500	.0067	.....	.....	
78,000	.0567	.0067	.....	.....	
80,000	.0633	.0066	.....	.....	
82,000	.0700	.0067	.....	.....	
84,000	.0933	.0233	.....	.....	
85,440	.1367	.0434	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds	85,440
t per square inch of original section	do	34,000
per inch after rupture	inch	0.1667
per inch under strain at elastic limit	do	.001267
diameter at point of rupture	do	.104
area after rupture, per centum of original section		33.5
upture		1″.50 from neck
broken surface	granular; dull eccentric spot	
f inch sections		″.12, ″.26, ″.12

No. 2655.

Marks, $^{10\,R_1\,J}_{B\,T_4\,M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000200	.000200	0.	.....	
2,500	10,000	.000400	.000200	0.	.....	
3,750	15,000	.000600	.000200	0.	.....	
5,000	20,000	.000767	.000167	0.	.....	
6,250	25,000	.000900	.000133	0.	.....	
7,500	30,000	.001200	.000300	.000167	.000167	Elastic limit.
7,750	31,000	.001267	.000067	.....	.....	
8,000	32,000	.001367	.000100	.....	.....	
8,250	33,000	.001433	.000066	.....	.....	
8,500	34,000	.001667	.000234	.....	.....	
8,750	35,000	.001800	.000133	.000600	.000433	
9,000	36,000	.002033	.000233	.....	.....	
9,250	37,000	.002333	.000300	.....	.....	
9,500	38,000	.002767	.000434	.....	.....	
9,750	39,000	.003167	.000400	.....	.....	
10,000	40,000	.003833	.000666	.....	.....	
10,250	41,000	.004500	.000667	.....	.....	
10,500	42,000	.005167	.000667	.....	.....	
10,750	43,000	.005833	.000666	.....	.....	
11,000	44,000	.006667	.000834	.....	.....	
11,250	45,000	.007333	.000666	.....	.....	
11,500	46,000	.008200	.000867	.....	.....	
11,750	47,000	.009100	.000900	.....	.....	
12,000	48,000	.010000	.000900	.....	.....	
12,250	49,000	.010833	.000833	.....	.....	
12,500	50,000	.011733	.000900	.....	.....	
13,000	52,000	.013733	.002000	.....	.....	
13,500	54,000	.015567	.001834	.....	.....	
14,000	56,000	.017867	.002300	.....	.....	
14,500	58,000	.020000	.002133	.....	.....	
15,000	60,000	.022500	.002500	.....	.....	
15,500	62,000	.025167	.002667	.....	.....	
16,000	64,000	.028000	.002833	.....	.....	
16,500	66,000	.031067	.003067	.....	.....	
17,000	68,000	.034667	.003600	.....	.....	
17,500	70,000	.038333	.003666	.....	.....	
18,000	72,000	.0433	.004967	.....	.....	
18,500	74,000	.0500	.0067	.....	.....	
19,000	76,000	.0567	.0067	.....	.....	
19,500	78,000	.0633	.0066	.....	.....	
20,000	80,000	.0733	.0100	.....	.....	
20,500	82,000	.0933	.0200	.....	.....	
21,000	84,000	.1333	.0400	.....	.....	
21,010	84,040	.1433	.0100	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	84,040
Elastic limit per square inch of original section	do	30,000
Elongation per inch after rupture	inch	0.1900
Elongation per inch under strain at elastic limit	do	.001200
Reduction in diameter at point of rupture	do	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		¾ inch from neck
Character of broken surface	granular; dull spot at circumference	
Elongation of inch sections		".14, ".15, ".28

No. 2656.

, 10 R, J
, B R_5
ter, ".564.
nal area, .25 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000133	.000133	0.	.....	
10,000	.000233	.000100	0.	.....	
15,000	.000333	.000100	0.	.....	
20,000	.000467	.000134	0.	.....	
25,000	.000633	.000166	0.	.....	
30,000	.000800	.000167	0.	.....	
31,000	.000833	.000033	.....	.....	
32,000	.000867	.000034	.....	.....	
33,000	.000967	.000100	.....	.....	
34,000	.001033	.000066	.....	.....	
35,000	.001100	.000067	.000067	.000067	
36,000	.001167	.000067	.....	.....	Elastic limit.
37,000	.001267	.000100	.....	.....	
38,000	.001400	.000133	.....	.....	
39,000	.001533	.000133	.....	.....	
40,000	.001700	.000167	.000467	.000400	
41,000	.001900	.000200	.....	.....	
42,000	.002100	.000200	.....	.....	
43,000	.002433	.000333	.....	.....	
44,000	.002967	.000534	.....	.....	
45,000	.003433	.000466	.....	.....	
46,000	.004067	.000634	.....	.....	
47,000	.004833	.000766	.....	.....	
48,000	.005667	.000834	.....	.....	
49,000	.006433	.000766	.....	.....	
50,000	.007400	.000967	.....	.....	
52,000	.009333	.001933	.....	.....	
54,000	.011000	.001667	.....	.....	
56,000	.013000	.002000	.....	.....	
58,000	.015000	.002000	.....	.....	
60,000	.017167	.002167	.....	.....	
62,000	.019667	.002500	.....	.....	
64,000	.021700	.002033	.....	.....	
66,000	.024500	.002800	.....	.....	
68,000	.027333	.002833	.....	.....	
70,000	.030000	.002667	.....	.....	
72,000	.033333	.003333	.....	.....	
74,000	.0400	.006667	.....	.....	
76,000	.0467	.0067	.....	.....	
78,000	.0533	.0066	.....	.....	
80,000	.0600	.0067	.....	.....	
82,000	.0667	.0067	.....	.....	
84,000	.0732	.0066	.....	.....	
86,000	.0900	.0167	.....	.....	
87,120	.1233	.0333	.....	.....	Tensile strength.

General summary.

ıgth per square inch of original section	pounds..	87,120
per square inch of original section	do...	36,000
er inch after rupture	inch..	0.1333
er inch under strain at elastic limit	do...	.001167
diameter at point of rupture	do...	.054
area after rupture, per centum of original section		18.3
upture		".15 from neck
broken surface	granular; dull eccentric spot	
f inch sections		".08, ".11, ".21*

No. 687.

Marks, $\frac{10\ R_1\ J}{B\ T_6\ I}$
Length, 5″.007
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001100	.000167	.....	.....	
20,000	40,000	.001233	.000133	.....	.....	
22,500	45,000	.001333	.000100	.....	.....	
25,000	50,000	.001500	.000167	.....	.....	
25,500	51,000	.001533	.000033	.....	.....	
26,000	52,000	.001567	.000034	.....	.....	
26,500	53,000	.001567	0.	.....	.....	
27,000	54,000	.001600	.000033	.....	.....	
27,500	55,000	.001633	.000033	.....	.....	
28,000	56,000	.001633	0.	.....	.....	
28,500	57,000	.001667	.000034	.....	.....	
29,000	58,000	.001700	.000033	.....	.....	
29,500	59,000	.001767	.000067	.....	.....	
30,000	60,000	.001833	.000066	.....	.....	Elastic limit.
30,500	61,000	.001933	.000100	.....	.....	
31,000	62,000	.002167	.000234	.....	.....	
31,500	63,000	.002400	.000233	.....	.....	
32,000	64,000	.002833	.000433	.....	.....	
32,500	65,000	.003267	.000434	.....	.....	
33,000	66,000	.003933	.000666	.....	.....	
33,500	67,000	.004833	.000900	.....	.....	
34,000	68,000	.005967	.001134	.....	.....	
46,600	93,200	.....	.....	.....	.....	Ultimate streng

General summary.

Elastic limit per square inch of original section.....pounds..
Compression per inch under stress at elastic limit.....inch..
Ultimate strength per square inch of original section.....pounds..
Manner of failure.....trip

No. 688.

Marks, $\frac{10\ R_1\ J}{B\ T_7\ O}$
Length, 5″.004.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000633	.000200	0.	.....	
12,500	25,000	.000833	.000200	0.	.....	
15,000	30,000	.001033	.000200	.000033	.000033	
17,500	35,000	.001200	.000167	.....	.....	
20,000	40,000	.001367	.000167	.....	.....	
22,500	45,000	.001667	.000300	.....	.....	
23,000	46,000	.001733	.000066	.....	.....	
23,500	47,000	.001833	.000100	.....	.....	
24,000	48,000	.001900	.000067	.....	.....	Elastic limit.
24,500	49,000	.002033	.000133	.....	.....	
25,000	50,000	.002200	.000167	.....	.....	
25,500	51,000	.002533	.000333	.....	.....	
26,000	52,000	.003100	.000567	.....	.....	
26,500	53,000	.003300	.000200	.....	.....	
27,000	54,000	.003567	.000267	.....	.....	
27,500	55,000	.003733	.000166	.....	.....	
28,000	56,000	.004000	.000267	.....	.....	
40,550	81,100	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds	48,000
Compression per inch under stress at elastic limit	inch	0.001900
Ultimate strength per square inch of original section	pounds	81,100
Manner of failure		triple flexure

No. 689.

Marks, $^{10\,R_1\,J}_{B\,T_2\,M}$
Length, 5″.005.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000067	.000067	0.	.....	
5,000	10,000	.000233	.000166	0.	.....	
7,500	15,000	.000400	.000167	0.	.....	
10,000	20,000	.000600	.000200	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.001000	.000233	.000033	.000033	
15,500	31,000	.001067	.000067	.....	.....	
16,000	32,000	.001133	.000066	.....	.....	Elastic limit.
16,500	33,000	.001400	.000267	.....	.....	
17,000	34,000	.001633	.000233	.....	.....	
17,500	35,000	.001867	.000234	.000667	.000634	
18,000	36,000	.002100	.000233	.....	.....	
18,500	37,000	.002433	.000333	.....	.....	
19,000	38,000	.003000	.000567	.....	.....	
19,500	39,000	.003400	.000400	.....	.....	
20,000	40,000	.004100	.000700	.....	.....	
20,500	41,000	.004567	.000467	.....	.....	
21,000	42,000	.005400	.000833	.....	.....	
38,160	76,320	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	32,000
Compression per inch under stress at elastic limit	inch..	0.001133
Ultimate strength per square inch of original section	pounds..	76,320
Manner of failure		triple flexure

No. 690.

Marks, $\frac{10\,R_1\,J}{B\,R_2}$
Length, 5″.001.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000067	.000067	0.	.....	
5,000	10,000	.000233	.000166	0.	.....	
7,500	15,000	.000400	.000167	0.	.....	
10,000	20,000	.000567	.000167	0.	.....	
12,500	25,000	.000733	.000166	0.	.....	
15,000	30,000	.000900	.000167	0.	.....	
17,500	35,000	.001067	.000167	.....	.....	
18,000	36,000	.001100	.000033	.....	.....	Elastic limit.
18,500	37,000	.001333	.000233	.....	.....	
19,000	38,000	.001567	.000234	.....	.....	
19,500	39,000	.001833	.000266	.....	.....	
20,000	40,000	.002067	.000234	.....	.....	
20,500	41,000	.002433	.000366	.....	.....	
21,000	42,000	.002867	.000434	.....	.....	
21,500	43,000	.003300	.000433	.....	.....	
22,000	44,000	.003833	.000533	.....	.....	
22,500	45,000	.004400	.000567	.....	.....	
23,000	46,000	.005000	.000600	.....	.....	
40,260	80,520	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds	36,000
Compression per inch under stress at elastic limit	inch	0.001100
Ultimate strength per square inch of original section	pounds	80,520
Manner of failure		triple flexure
Specific gravity (outside)		7.8635

No. 691.

Marks, $^{10\,R_1\,J}_{B\,R_{10}}$
Length, 5″.007.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarl
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	.000033	.000033	
17,500	35,000	.001233	.000300	.000133	.000100	Elastic limit.
18,000	36,000	.001367	.000134	.....	.....	
18,500	37,000	.001567	.000200	.....	.....	
19,000	38,000	.001900	.000333	.....	.....	
19,500	39,000	.002200	.000300	.....	.....	
20,000	40,000	.002533	.000333	.....	.....	
20,500	41,000	.003033	.000500	.....	.....	
21,000	42,000	.003500	.000467	.....	.....	
21,500	43,000	.004067	.000567	.....	.....	
22,000	44,000	.004533	.000466	.....	.....	
22,500	45,000	.005167	.000634	.....	.....	
23,000	46,000	.006200	.001033	.....	.....	
40,740	81,480	.....	.....	.....	.....	Ultimate stren

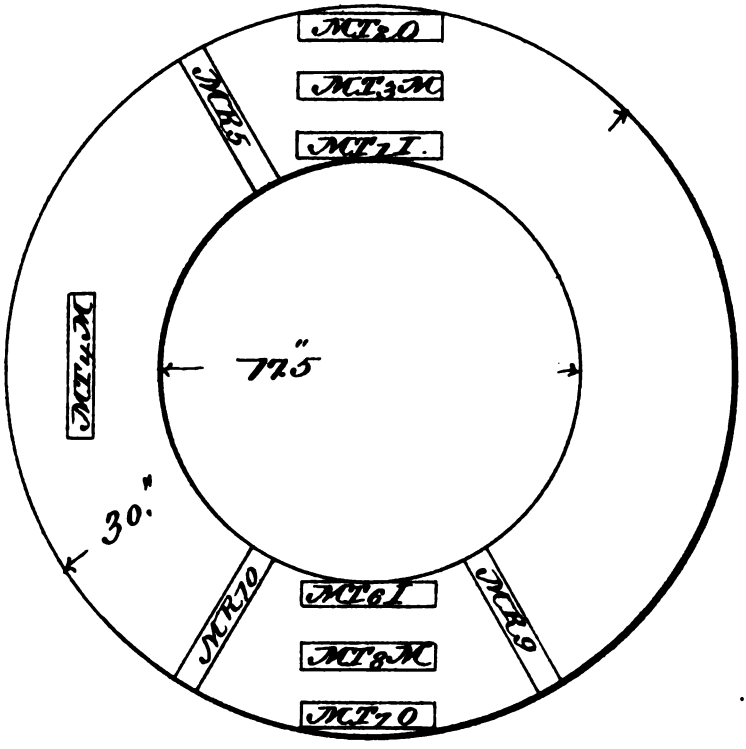
General summary.

Elastic limit per square inch of original section ..... pound
Compression per inch under stress at elastic limit ..... inc
Ultimate strength per square inch of original section ..... pound
Manner of failure ..... t
Specific gravity (inside) .....

10" Steel B.L. Rifle No. 1.

Jacket

Muzzle end.



H Ex 31 492

No. 2647.

Marks, $\frac{10\ R_1\ J}{M\ T_1\ I}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000200	.000200	0.	.....	
2,500	10,000	.000367	.000167	0.	.....	
3,750	15,000	.000533	.000166	0.	.....	
5,000	20,000	.000700	.000167	0.	.....	
6,250	25,000	.000867	.000167	0.	.....	
7,500	30,000	.001033	.000166	0.	.....	
7,750	31,000	.001067	.000034	0.	.....	
8,000	32,000	.001133	.000066	0.	.....	
8,250	33,000	.001167	.000034	0.	.....	
8,500	34,000	.001200	.000033	0.	.....	
8,750	35,000	.001267	.000067	0.	.....	
9,000	36,000	.001300	.000033	.....	.....	
9,250	37,000	.001367	.000067	.....	.....	Elastic limit.
9,500	38,000	.001467	.000100	.....	.....	
9,750	39,000	.002533	.001066	.....	.....	
10,000	40,000	.003000	.000467	.....	.....	
10,250	41,000	.003667	.000667	.....	.....	
10,500	42,000	.004433	.000766	.....	.....	
10,750	43,000	.005133	.000700	.....	.....	
11,000	44,000	.005700	.000567	.....	.....	
11,250	45,000	.006600	.000900	.....	.....	
11,500	46,000	.007367	.000767	.....	.....	
12,000	48,000	.009067	.001700	.....	.....	
12,500	50,000	.011000	.001933	.....	.....	
13,000	52,000	.013000	.002000	.....	.....	
13,500	54,000	.015067	.002067	.....	.....	
14,000	56,000	.017500	.002433	.....	.....	
14,500	58,000	.020000	.002500	.....	.....	
15,000	60,000	.022833	.002833	.....	.....	
15,500	62,000	.026000	.003167	.....	.....	
16,000	64,000	.029000	.003000	.....	.....	
16,500	66,000	.032667	.003667	.....	.....	
17,000	68,000	.036667	.004000	.....	.....	
17,500	70,000	.0400	.003333	.....	.....	
18,000	72,000	.0500	.0100	.....	.....	
18,500	74,000	.0600	.0100	.....	.....	
19,000	76,000	.0667	.0067	.....	.....	
19,500	78,000	.0733	.0066	.....	.....	
20,000	80,000	.0967	.0234	.....	.....	
20,500	82,000	.1367	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	82,000
Elastic limit per square inch of original section	do	37,000
Elongation per inch after rupture	inch	0.2000
Elongation per inch under strain at elastic limit	do	.001367
Reduction in diameter at point of rupture	do	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		1″.26 from neck
Character of broken surface		silky
Elongation of inch sections		″.08, ″.26, ″.26*

No. 2648.

Marks, $^{10\ R_1\ J}_{M\ T_2\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000233	.000233	0.	.....	
2,500	10,000	.000433	.000200	0.	.....	
3,750	15,000	.000633	.000200	0.	.....	
5,000	20,000	.000800	.000167	0.	.....	
6,250	25,000	.000967	.000167	0.	.....	
7,500	30,000	.001167	.000200	.000033	.000033	
7,750	31,000	.001167	0.	.....	.....	
8,000	32,000	.001200	.000033	.....	.....	
8,250	33,000	.001233	.000033	.....	.....	
8,500	34,000	.001267	.000034	.....	.....	
8,750	35,000	.001300	.000033	.....	.....	
9,000	36,000	.001333	.000033	.....	.....	
9,250	37,000	.001367	.000034	.....	.....	
9,500	38,000	.001400	.000033	.....	.....	
9,750	39,000	.001433	.000033	.....	.....	
10,000	40,000	.001467	.000034	.....	.....	
10,250	41,000	001500	.000033	.....	.....	
10,500	42,000	.001533	.000033	.....	.....	
10,750	43,000	.001600	.000067	.....	.....	
11,000	44,000	.001667	.000067	.....	.....	Elastic limit.
11,250	45,000	.001767	.000100	.....	.....	
11,500	46,000	.002100	.000333	.....	.....	
11,750	47,000	.004133	.002033	.....	.....	
12,000	48,000	.004733	.000600	.....	.....	
12,250	49,000	.005367	.000634	.....	.....	
12,500	50,000	.005967	.000600	.....	.....	
12,750	51,000	.006667	.000700	.....	.....	
13,000	52,000	.007567	.000900	.....	.....	
13,500	54,000	.009267	.001700	.....	.....	
14,000	56,000	.011033	.001766	.....	.....	
14,500	58,000	.012900	.001867	.....	.....	
15,000	60,000	.014833	.001933	.....	.....	
15,500	62,000	.016900	.002067	.....	.....	
16,000	64,000	.019767	.002867	.....	.....	
16,500	66,000	.021700	.001933	.....	.....	
17,000	68,000	.024333	.002633	.....	.....	
17,500	70,000	.027233	.002900	.....	.....	
18,000	72,000	.030167	.002934	.....	.....	
18,500	74,000	.034000	.003833	.....	.....	
19,000	76,000	.0367	.0027	.....	.....	
19,500	78,000	.0400	.0033	.....	.....	
20,000	80,000	.0467	.0067	.....	.....	
20,500	82,000	.0567	.0100	.....	.....	
21,000	84,000	.0667	.0100	.....	.....	
21,500	86,000	.0767	.0100	.....	.....	
22,000	88,000	.0967	.0200	.....	.....	
22,500	90,000	.1367	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds.
Elastic limit per square inch of original section ..... do..
Elongation per inch after rupture ..... inch.
Elongation per inch under strain at elastic limit ..... do..
Reduction in diameter at point of rupture ..... do..
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ".70
Character of broken surface ..... silky; trace of g
Elongation of inch sections ..... ".36

No. 2649.

ıS, $\frac{10\ R_1\ I}{M\ T_2\ M}$
ıeter, ".564.
onal area, .25 square inch.

plied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000100	.000100	0.	.....	
10,000	.000267	.000167	0.	.....	
15,000	.000433	.000166	0.	.....	
20,000	.000600	.000167	0.	.....	
25,000	.000800	.000200	0.	.....	
30,000	.001033	.000233	.....	.....	
31,000	.001067	.000034	.....	.....	
32,000	.001100	.000033	.....	.....	
33,000	.001133	.000033	.....	.....	
34,000	.001167	.000034	.....	.....	
35,000	.001200	.000033	.....	.....	
36,000	.001267	.000067	.....	.....	
37,000	.001300	.000033	.....	.....	
38,000	.001367	.000067	.....	.....	
39,000	.001467	.000100	.....	.....	Elastic limit.
40,000	.005900	.004433	.....	.....	
41,000	.006333	.000433	.....	.....	
42,000	.007333	.001000	.....	.....	
43,000	.008100	.000767	.....	.....	
44,000	.009000	.000900	.....	.....	
46,000	.010933	.001933	.....	.....	
48,000	.012667	.001734	.....	.....	
50,000	.014933	.002266	.....	.....	
52,000	.017267	.002334	.....	.....	
54,000	.019700	.002433	.....	.....	
56,000	.022267	.002567	.....	.....	
58,000	.025400	.003133	.....	.....	
60,000	.028367	.002967	.....	.....	
62,000	.032000	.003633	.....	.....	
64,000	.036033	.004033	.....	.....	
66,000	.0400	.003967	.....	.....	
68,000	.0467	.0067	.....	.....	
70,000	.0567	.0100	.....	.....	
72,000	.0667	.0100	.....	.....	
74,000	.0733	.0066	.....	.....	
76,000	.0900	.0167	.....	.....	
78,000	.1067	.0167	.....	.....	
80,000	.1467	.0400	.....	.....	
80,400	.2000	.0533	.....	.....	Tensile strength.

General summary.

rength per square inch of original section	pounds	80,400
ıit per square inch of original section	do	39,000
ı per inch after rupture	inch	0.2600
ı per inch under strain at elastic limit	do	.001467
in diameter at point of rupture	do	.144
in area after rupture, per centum of original section		44.6
' rupture		at middle of stem
of broken surface	silky; trace of granulation; opened cracks in surface of stem	
of inch sections		".18, ".42*, ".18

No. 2650.

Marks, $^{10\,R_1\,J}_{M\,T_4\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000233	.000233	0.	.....	
2,500	10,000	.000467	.000234	0.	.....	
3,750	15,000	.000633	.000166	0.	.....	
5,000	20,000	.000833	.000200	0.	.....	
6,250	25,000	.000967	.000134	.000033	.000033	
7,500	30,000	.001100	.000133	.....	.....	
7,750	31,000	.001167	.000067	.....	.....	
8,000	32,000	.001200	.000033	.....	.....	
8,250	33,000	.001267	.000067	.....	.....	
8,500	34,000	.001300	.000033	.....	.....	
8,750	35,000	.001367	.000067	.....	.....	
9,000	36,000	.001400	.000033	.....	.....	
9,250	37,000	.001467	.000067	.....	.....	
9,500	38,000	.001500	.000033	.....	.....	Elastic limit.
9,750	39,000	.001633	.000133	.....	.....	
10,000	40,000	.006600	.004967	.....	.....	
10,250	41,000	.007100	.000500	.....	.....	
10,500	42,000	.007867	.000767	.....	.....	
10,750	43,000	.008600	.000733	.....	.....	
11,000	44,000	.009367	.000767	.....	.....	
11,250	45,000	.010267	.000900	.....	.....	
11,500	46,000	.011367	.001100	.....	.....	
12,000	48,000	.013133	.001766	.....	.....	
12,500	50,000	.015367	.002234	.....	.....	
13,000	52,000	.017667	.002300	.....	.....	
13,500	54,000	.020267	.002600	.....	.....	
14,000	56,000	.022800	.002533	.....	.....	
14,500	58,000	.026000	.003200	.....	.....	
15,000	60,000	.029100	.003100	.....	.....	
15,500	62,000	.032900	.003800	.....	.....	
16,000	64,000	.036833	.003933	.....	.....	
16,500	66,000	.0400	.003167	.....	.....	
17,000	68,000	.0467	.0067	.....	.....	
17,500	70,000	.0533	.0066	.....	.....	
18,000	72,000	.0600	.0067	.....	.....	
18,500	74,000	.0700	.0100	.....	.....	
19,000	76,000	.0900	.0200	.....	.....	
19,500	78,000	.1067	.0167	.....	.....	
20,000	80,000	.1500	.0433	.....	.....	
20,200	80,800	.2167	.0667	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds..
Elastic limit per square inch of original section.....do...
Elongation per inch after rupture.....inch..
Elongation per inch under strain at elastic limit.....do...
Reduction in diameter at point of rupture.....do...
Reduction in area after rupture, per centum of original section.....
Position of rupture.....1″.80 f
Character of broken surface.....
Elongation of inch sections.....″.18,

No. 2651.

10 R, J
) M R.
ıter, ".564.
nal area, .25 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000067	.000067	0.	.....	
10,000	.000167	.000100	0.	.....	
15,000	.000300	.000133	0.	.....	
20,000	.000467	.000167	0.	.....	
25,000	.000633	.000166	0.	.....	
30,000	.000867	.000234	0.	.....	
31,000	.000900	.000033	.....	.....	
32,000	.000967	.000067	.....	.....	
33,000	.001033	.000066	.....	.....	
34,000	.001133	.000100	.....	.....	Elastic limit.
35,000	.001300	.000167	.....	.....	
36,000	.002667	.001367	.....	.....	
37,000	.003533	.000866	.....	.....	
38,000	.004267	.000734	.....	.....	
39,000	.005033	.000766	.....	.....	
40,000	.005633	.000600	.....	.....	
41,000	.006267	.000634	.....	.....	
42,000	.007100	.000833	.....	.....	
43,000	.007900	.000800	.....	.....	
44,000	.008700	.000800	.....	.....	
45,000	.009900	.001200	.....	.....	
46,000	.010467	.000567	.....	.....	
48,000	.012700	.002233	.....	.....	
50,000	.014733	.002033	.....	.....	
52,000	.016967	.002234	.....	.....	
54,000	.019500	.002533	.....	.....	
56,000	.022000	.002500	.....	.....	
58,000	.025033	.003033	.....	.....	
60,000	.028000	.002967	.....	.....	
62,000	.031667	.003667	.....	.....	
64,000	.035333	.003666	.....	.....	
66,000	.0400	.004667	.....	.....	
68,000	.0433	.0033	.....	.....	
70,000	.0533	.0100	.....	.....	
72,000	.0600	.0067	.....	.....	
74,000	.0700	.0100	.....	.....	
76,000	.0833	.0133	.....	.....	
78,000	.1033	.0200	.....	.....	
80,000	.1333	.0300	.....	.....	
80,400	.1767	.0434	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	80,400
t per square inch of original section	do...	34,000
per inch after rupture	inch..	0.2267
per inch under strain at elastic limit	do...	.001133
n diameter at point of rupture	do...	.144
n area after rupture, per centum of original section		44.6
rupture	at middle of stem ; oblique	
f broken surface		silky
of inch sections		".13, ".39", ".16

No. 682.

Marks, $^{10}_{M}\ R_1\ J\ T_6\ I$
Length, 5″.004.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000900	.000133	0.	.....	
15,500	31,000	.000933	.000033	.....	.....	
16,000	32,000	.000967	.000034	.....	.....	
16,500	33,000	.001000	.000033	.....	.....	
17,000	34,000	.001033	.000033	.....	.....	
17,500	35,000	.001100	.000067	.....	.....	
18,000	36,000	.001133	.000033	.....	.....	
18,500	37,000	.001167	.000034	.....	.....	
19,000	38,000	.001200	.000033	.....	.....	
19,500	39,000	.001233	.000033	.....	.....	
20,000	40,000	.001333	.000100	.....	.....	
20,500	41,000	.001333	0.	.....	.....	
21,000	42,000	.001400	.000067	.....	.....	
21,500	43,000	.001500	.000100	.....	.....	
22,000	44,000	.001567	.000067	.....	.....	
22,500	45,000	.001633	.000066	.....	.....	Elastic limit.
23,000	46,000	.001767	.000134	.....	.....	
23,500	47,000	.001933	.000166	.....	.....	
24,000	48,000	.002167	.000234	.....	.....	
24,500	49,000	.002567	.000400	.....	.....	
25,000	50,000	.002867	.000300	.....	.....	
25,500	51,000	.005000	.002133	.....	.....	
26,000	52,000	.005667	.000667	.....	.....	
26,500	53,000	.006167	.000500	.....	.....	
27,000	54,000	.006867	.000700	.....	.....	
27,500	55,000	.007733	.000866	.....	.....	
40,800	81,600	.....	.....	.....	.....	Ultimate strengt

General summary.

Elastic limit per square inch of original section.....pounds
Compression per inch under stress at elastic limit ..... inch
Ultimate strength per square inch of original section .....pounds
Manner of failure.....tri

No. 683.

3, 10 R, J
M T, O
h, 5″.005.
eter, ″.798.
nal area, .50 square inch.

ied loads. Per square inch.	Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000133	.000133	0.	.....	
10,000	.000333	.000200	0.	.....	
15,000	.000500	.000167	0.	.....	
20,000	.000667	.000167	0.	.....	
25,000	.000833	.000166	0.	.....	
30,000	.001000	.000167	0.	.....	
31,000	.001000	0.	.....	.....	
32,000	.001033	.000033	.....	.....	
33,000	.001033	0.	.....	.....	
34,000	.001067	.000034	.....	.....	
35,000	.001133	.000066	.....	.....	
36,000	.001167	.000034	.....	.....	
37,000	.001167	0.	.....	.....	
38,000	.001167	0.	.....	.....	
39,000	.001233	.000066	.....	.....	
40,000	.001267	.000034	.....	.....	
41,000	.001300	.000033	.....	.....	
42,000	.001300	0.	.....	.....	
43,000	.001333	.000033	.....	.....	
44,000	.001367	.000034	.....	.....	
45,000	.001433	.000066	.....	.....	
46,000	.001467	.000034	.....	.....	
47,000	.001500	.000033	.....	.....	Elastic limit.
48,000	.001833	.000333	.....	.....	
49,000	.002600	.000767	.....	.....	
50,000	.003200	.000600	.....	.....	
51,000	.003667	.000467	.....	.....	
52,000	.004267	.000600	.....	.....	
53,000	.004833	.000566	.....	.....	
54,000	.005333	.000500	.....	.....	
55,000	.006000	.000667	.....	.....	
56,000	.006600	.000600	.....	.....	
86,400	.....	.....	.....	.....	Ultimate strength.

General summary.

per square inch of original section	pounds..	47,000
per inch under stress at elastic limit	inch..	0.001500
ength per square inch of original section	pounds..	86,400
ailure		triple flexure

No. 684.

Marks, $\frac{10\ R,\ J}{M\ T,\ M}$
Length, 5″.007.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000300	.000200	0.	.....	
7,500	15,000	.000467	.000167	0.	.....	
10,000	20,000	.000633	.000166	0.	.....	
12,500	25,000	.000800	.000167	0.	.....	
15,000	30,000	.001000	.000200	0.	.....	
17,500	35,000	.001300	.000300	.000100	.000100	
18,000	36,000	.001333	.000033	.....	.....	Elastic limit.
18,500	37,000	.001500	.000167	.....	.....	
19,000	38,000	.004500	.003000	.....	.....	
19,500	39,000	.004933	.000433	.....	.....	
20,000	40,000	.005500	.000567	.....	.....	
20,500	41,000	.006100	.000600	.....	.....	
21,000	42,000	.006667	.000567	.....	.....	
21,500	43,000	.007333	.000666	.....	.....	
22,000	44,000	.008100	.000767	.....	.....	
22,500	45,000	.008833	.000733	.....	.....	
23,000	46,000	.009633	.000800	.....	.....	
23,500	47,000	.010367	.000734	.....	.....	
24,000	48,000	.011333	.000966	.....	.....	
24,500	49,000	.012167	.000834	.....	.....	
25,000	50,000	.012967	.000800	.....	.....	
36,900	73,800	.....	.....	.....	.....	Ultimate streng

General summary.

Elastic limit per square inch of original section .....pounds.
Compression per inch under stress at elastic limit.....inch.
Ultimate strength per square inch of original section .....pounds.
Manner of failure .....tr

No. 685.

ks, 10 R, J / M R.
gth, 5″.001.
neter, ″.798.
ional area, .50 square inch.

plied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
l.	Per square inch.					
ls.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000100	.000100	0.	.....	
0	10,000	.000267	.000167	0.	.....	
0	15,000	.000467	.000200	0.	.....	
0	20,000	.000600	.000133	0.	.....	
0	25,000	.000767	.000167	0.	.....	
0	30,000	.000933	.000166	0.	.....	
0	35,000	.001133	.000200	.....	.....	
0	36,000	.001167	.000034	.....	.....	
0	37,000	.001200	.000033	.....	.....	
0	38,000	.001233	.000033	.....	.....	
0	39,000	.001300	.000067	.....	.....	
0	40,000	.001333	.000033	.....	.....	
0	41,000	.001367	.000034	.....	.....	
0	42,000	.001400	.000033	.....	.....	Elastic limit
0	43,000	{ .001500 { .005567	.000100 .004067	.....	.....	
0	44,000	.007167	.001600	.....	.....	
0	45,000	.007933	.000766	.....	.....	
0	46,000	.008367	.000434	.....	.....	
0	71,700	.....	.....	.....	.....	Ultimate strength.

General summary.

mit per square inch of original section	pounds..	42,000
tion per inch under stress at elastic limit	inch..	0.001400
strength per square inch of original section	pounds..	71,700
f failure		triple flexure

No. 686.

Marks, $^{10\,R_1\,J}_{M\,R_{10}}$
Length, 5″.007.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remar
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000067	.000067	0.	.....	
5,000	10,000	.000233	.000166	0.	.....	
7,500	15,000	.000400	.000167	0.	.....	
10,000	20,000	.000567	.000167	0.	.....	
12,500	25,000	.000733	.000166	0.	.....	
15,000	30,000	.000900	.000167	.000033	.000033	
17,500	35,000	.001067	.000167	.....	.....	
18,000	36,000	.001100	.000033	.....	.....	
18,500	37,000	.001133	.000033	.....	.....	
19,000	38,000	.001167	.000034	.....	.....	
19,500	39,000	.001200	.000033	.....	.....	
20,000	40,000	.001233	.000033	.....	.....	
20,500	41,000	.001267	.000034	.....	.....	
21,000	42,000	.001300	.000033	.....	.....	Elastic limit.
21,500	43,000	.004067	.002767	.....	.....	
22,000	44,000	.004967	.000900	.....	.....	
23,500	45,000	.005700	.000733	.....	.....	
26,000	46,000	.006900	.001200	.....	.....	
36,100	72,200	.....	.....	.....	.....	Ultimate stre

General summary.

Elastic limit per square inch of original section .....poun
Compression per inch under stress at elastic limit .....in
Ultimate strength per square inch of original section .....poun
Manner of failure .....
Specific gravity .....

SPECIMENS FROM WHITWORTH STEEL TRUNNION HOOP

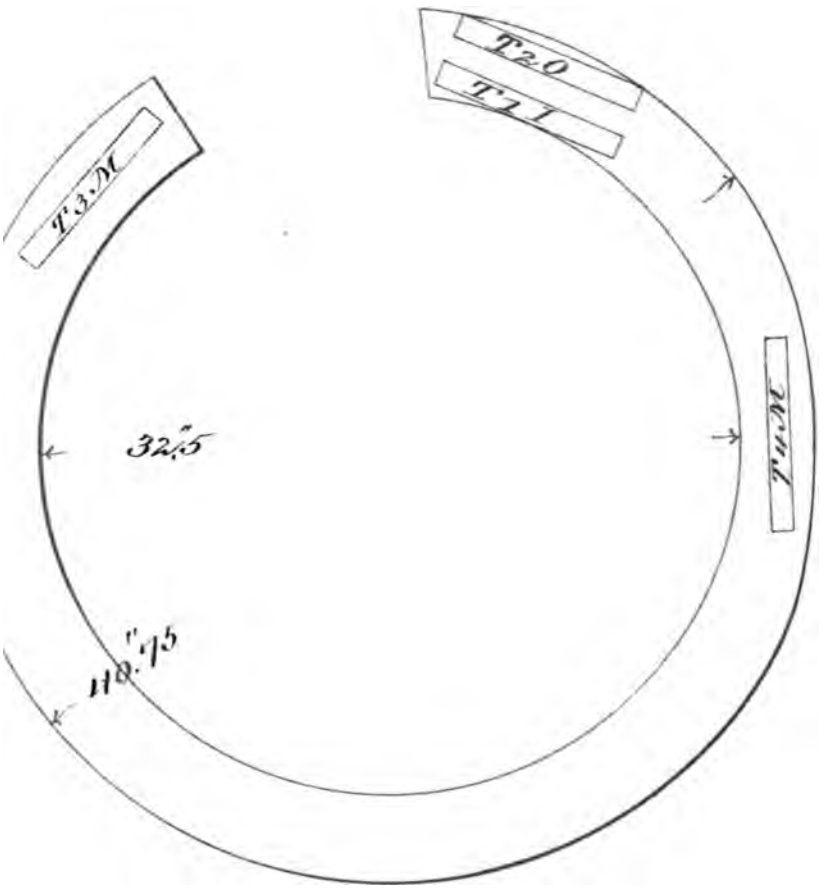
FOR

10-INCH STEEL B. L. RIFLE NO. 1.

1015

'0" Steel R. L. Rifle No. 1.

Trunnion Hoop.



H Ex 31 492

MENS FROM WHITWORTH STEEL TRUNNION HOOP FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. 2746.

ks, 10 B. T H
T. I
meter, ".564.
onal area, .25 square inch.

loads. / uare	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
	Inch.	*Inch.*	*Inch.*	*Inch.*	
	0.	0.	0.	0.	Initial load.
	.000117	.000117	0.	.....	
	.000233	.000116	0.	.....	
	.000400	.000167	0.	.....	
	.000583	.000183	0.	.....	
	.000783	.000200	0.	.....	
	.000983	.000200	0.	.....	
	.001017	.000034	.....	.....	
	.001050	.000033	.....	.....	
	.001100	.000050	.....	.....	
	.001167	.000067	.....	.....	
	.001200	.000033	.000050	.000050	
	.001267	.000067	.....	.....	
	.001317	.000050	.....	.....	
	.001383	.000066	.....	.....	
	.001433	.000050	.....	.....	Elastic limit.
	.001533	.000100	.....	.....	
	.001633	.000100	.....	.....	
	.001817	.000184	.....	.....	
	.002017	.000200	.....	.....	
	.002267	.000250	.....	.....	
	.002650	.000383	.....	.....	
	.003167	.000517	.....	.....	
	.003700	.000533	.....	.....	
	.004500	.000800	.....	.....	
	.005133	.000633	.....	.....	
	.006167	.001034	.....	.....	
	.008000	.001833	.....	.....	
	.010667	.002667	.....	.....	
	.012500	.001833	.....	.....	
	.014167	.001667	.....	.....	
	.016500	.002333	.....	.....	
	.019000	.002500	.....	.....	
	.021417	.002417	.....	.....	
	.024167	.002750	.....	.....	
	.0283	.004133	.....	.....	
	.0317	.0034	.....	.....	
	.0350	.0033	.....	.....	
	.0383	.0033	.....	.....	
	.0450	.0067	.....	.....	
	.0517	.0067	.....	.....	
	.0600	.0083	.....	.....	
	.0750	.0150	.....	.....	
	.0950	.0200	.....	.....	Tensile strength.

General summary.

er square inch of original section	pounds..	82,960
quare inch of original section	do...	39,000
ch after rupture	inch..	0.1333
ch under strain at elastic limit	do...	.001433
meter at point of rupture	do...	.184
a after rupture, per centum of original section		54.6
are		⅜ inch from neck
oken surface		silky
ch sections		".40*, ".12, ".08, ".07, ".06, ".05

No. 2747.

Marks, $^{10\,R_1\,T\,H}_{T_2\,O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Rema
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000800	.000183	0.	.....	
7,500	30,000	.000983	.000183	0.	.....	
7,750	31,000	.001000	.000017	.....	.....	
8,000	32,000	.001050	.000050	.....	.....	
8,250	33,000	.001083	.000033	.....	.....	
8,500	34,000	.001133	.000050	.....	.....	
8,750	35,000	.001150	.000017	.000017	.000017	
9,000	36,000	.001217	.000067	.....	.....	
9,250	37,000	.001250	.000033	.....	.....	
9,500	38,000	.001300	.000050	.....	.....	
9,750	39,000	.001333	.000033	.....	.....	
10,000	40,000	.001383	.000050	.....	.....	
10,250	41,000	.001450	.000067	.....	.....	
10,500	42,000	.001500	.000050	.....	.....	Elastic limit
10,750	43,000	.001600	.000100	.....	.....	
11,000	44,000	.001817	.000217	.....	.....	
11,250	45,000	.002133	.000316	.....	.....	
11,500	46,000	.002683	.000550	.....	.....	
11,750	47,000	.003167	.000484	.....	.....	
12,000	48,000	.004000	.000833	.....	.....	
12,250	49,000	.004700	.000700	.....	.....	
12,500	50,000	.005833	.001133	.....	.....	
12,750	51,000	.006750	.000917	.....	.....	
13,000	52,000	.007833	.001083	.....	.....	
13,250	53,000	.008800	.000967	.....	.....	
13,500	54,000	.009833	.001033	.....	.....	
14,000	56,000	.011667	.001834	.....	.....	
14,500	58,000	.014050	.002383	.....	.....	
15,000	60,000	.016333	.002283	.....	.....	
15,500	62,000	.018833	.002500	.....	.....	
16,000	64,000	.021333	.002500	.....	.....	
16,500	66,000	.024167	.002834	.....	.....	
17,000	68,000	.0283	.004133	.....	.....	
17,500	70,000	.0317	.0034	.....	.....	
18,000	72,000	.0350	.0033	.....	.....	
18,500	74,000	.0383	.0033	.....	.....	
19,000	76,000	.0450	.0067	.....	.....	
19,500	78,000	.0500	.0050	.....	.....	
20,000	80,000	.0600	.0100	.....	.....	
20,500	82,000	.0683	.0083	.....	.....	
21,000	84,000	.0883	.0200	.....	.....	
21,360	85,440	.1317	.0434	.....	.....	Tensile stre

General summary.

Tensile strength per square inch of original section ..... pou
Elastic limit per square inch of original section .....
Elongation per inch after rupture .....
Elongation per inch under strain at elastic limit .....
Reduction in diameter at point of rupture .....
Reduction in area after rupture, per centum of original section .....
Position of rupture .....
Character of broken surface .....
Elongation of inch sections ..... ".09, ".42*, ".1

No. 2748.

Marks, $^{10}\,\mathrm{R_1\,T\,H}_{\mathrm{T_2\,M}}$
Diameter, ″.564.
Sectional area, .50 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	.....	.....	
2,500	10,000	.000317	.000167	.....	.....	
3,750	15,000	.000483	.000166	.....	.....	
5,000	20,000	.000650	.000167	.....	.....	
6,250	25,000	.000817	.000167	.....	.....	
7,500	30,000	.001050	.000233	.000083	.000083	
7,750	31,000	.001100	.000050	.....	.....	
8,000	32,000	.001167	.000067	.....	.....	
8,250	33,000	.001217	.000050	.....	.....	
8,500	34,000	.001283	.000066	.....	.....	
8,750	35,000	.001333	.000050	.000183	.000100	Elastic limit.
9,000	36,000	.001500	.000067	.....	.....	
9,250	37,000	.001633	.000133	.....	.....	
9,500	38,000	.001833	.000200	.....	.....	
9,750	39,000	.002167	.000334	.....	.....	
10,000	40,000	.002700	.000533	.....	.....	
10,250	41,000	.003133	.000433	.....	.....	
10,500	42,000	.003883	.000750	.....	.....	
10,750	43,000	.004583	.000700	.....	.....	
11,000	44,000	.005417	.000834	.....	.....	
11,250	45,000	.006267	.000850	.....	.....	
11,500	46,000	.007183	.000916	.....	.....	
11,750	47,000	.008267	.001084	.....	.....	
12,000	48,000	.009517	.001250	.....	.....	
12,250	49,000	.010417	.000900	.....	.....	
12,500	50,000	.011417	.001000	.....	.....	
13,000	52,000	.013717	.002300	.....	.....	
13,500	54,000	.015917	.002200	.....	.....	
14,000	56,000	.018583	.002666	.....	.....	
14,500	58,000	.021167	.002584	.....	.....	
15,000	60,000	.024250	.003083	.....	.....	
15,500	62,000	.0283	.004050	.....	.....	
16,000	64,000	.0317	.0034	.....	.....	
16,500	66,000	.0350	.0033	.....	.....	
17,000	68,000	.0383	.0033	.....	.....	
17,500	70,000	.0467	.0084	.....	.....	
18,000	72,000	.0533	.0066	.....	.....	
18,500	74,000	.0617	.0084	.....	.....	
19,000	76,000	.0717	.0100	.....	.....	
19,500	78,000	.0917	.0200	.....	.....	
19,880	79,520	.1367	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	79,520
Elastic limit per square inch of original section	do...	35,000
Elongation per inch after rupture	inch..	0.1833
Elongation per inch under strain at elastic limit	do...	.001333
Reduction in diameter at point of rupture	do...	.194
Reduction in area after rupture, per centum of original section		57.0
Position of rupture		⅜ inch from neck
Character of broken surface		silky
Elongation of inch sections		″.43*, ″.16, ″.15, ″.13, ″.11, ″.12

No. 2749.

Marks, $^{10\ R_1\ T\ H}_{T_4\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Rema
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000967	.000184	0.	.....	
7,750	31,000	.001000	.000033	.....	.....	
8,000	32,000	.001033	.000033	.....	.....	
8,250	33,000	.001067	.000034	.....	.....	
8,500	34,000	.001117	.000050	.....	.....	
8,750	35,000	.001167	.000050	0.	.....	
9,000	36,000	.001183	.000016	.....	.....	
9,250	37,000	.001217	.000034	.....	.....	
9,500	38,000	.001267	.000050	.....	.....	
9,750	39,000	.001300	.000033	.....	.....	
10,000	40,000	.001333	.000033	.....	.....	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001417	.000050	.....	.....	
10,750	43,000	.001450	.000033	.....	.....	Elastic limit
11,000	44,000	.001550	.000100	.....	.....	
11,250	45,000	.002233	.000683	.....	.....	
11,500	46,000	.003500	.001267	.....	.....	
11,750	47,000	.004183	.000683	.....	.....	
12,000	48,000	.005750	.000567	.....	.....	
12,250	49,000	.007167	.001417	.....	.....	
12,500	50,000	.009750	.002583	.....	.....	
12,750	51,000	.011167	.001417	.....	.....	
13,000	52,000	.011833	.000666	.....	.....	
13,250	53,000	.012167	.000334	.....	.....	
13,500	54,000	.013167	.001000	.....	.....	
13,750	55,000	.014167	.001000	.....	.....	
14,000	56,000	.015200	.001033	.....	.....	
14,500	58,000	.017500	.002300	.....	.....	
15,000	60,000	.020000	.002500	.....	.....	
15,500	62,000	.022500	.002500	.....	.....	
16,000	64,000	.025000	.002500	.....	.....	
16,500	66,000	.0283	.0033	.....	.....	
17,000	68,000	.0317	.0034	.....	.....	
17,500	70,000	.0350	.0033	.....	.....	
18,000	72,000	.0383	.0033	.....	.....	
18,500	74,000	.0450	.0067	.....	.....	
19,000	76,000	.0500	.0050	.....	.....	
19,500	78,000	.0567	.0067	.....	.....	
20,000	80,000	.0667	.0100	.....	.....	
20,500	82,000	.0833	.0166	.....	.....	
20,980	83,920	.1267	.0434	.....	.....	Tensile stre

General summary.

Tensile strength per square inch of original section ..... pou
Elastic limit per square inch of original section .....
Elongation per inch after rupture .....
Elongation per inch under strain at elastic limit.....
Reduction in diameter at point of rupture.....
Reduction in area after rupture, per centum of original section.....
Position of rupture.....
Character of broken surface .....
Elongation of inch sections..... ″.13, ″.44°, ″.15,

STEEL SPECIMENS FROM HOOPS

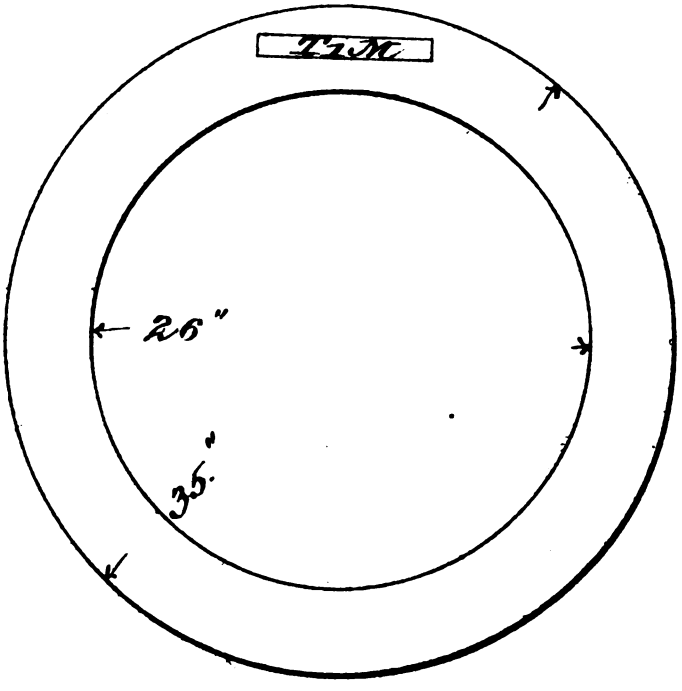
FOR

10-INCH STEEL B. L. RIFLE NO. 1.

1021

10" Steel B. L. Rifle No. 1

Hoop A 4



H Ex 31 492

STEEL SPECIMENS FROM HOOPS FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. 2678.

Marks, $^{10}\,{}^{R_1\,A_4}_{T_1\,M}$
Diameter, ".564.
Sectional area, .25 square inch.

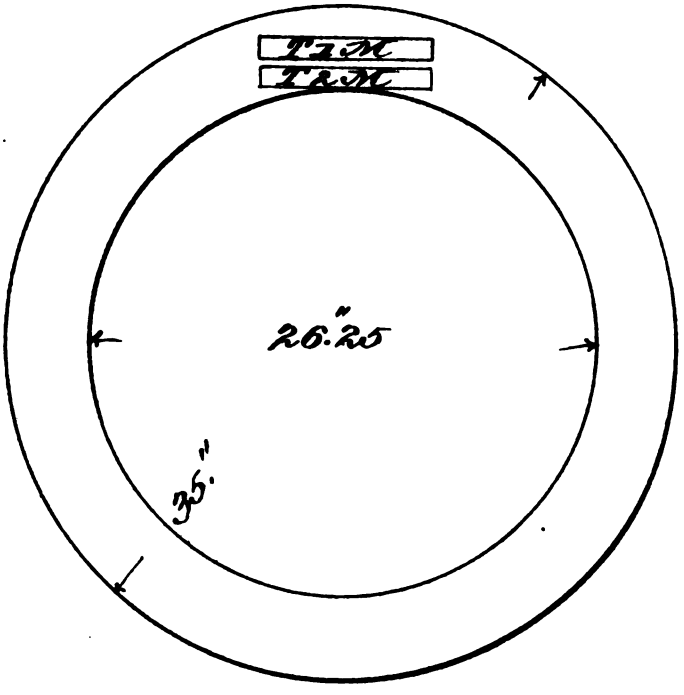
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000300	.000133	0.	.....	
3,750	15,000	.000550	.000250	0.	.....	
5,000	20,000	.000717	.000167	0.	.....	
6,250	25,000	.000933	.000216	.000017	.000017	
7,500	30,000	.001133	.000200	.000050	.000030	
8,750	35,000	.001267	.000134	.000050	0.	
10,000	40,000	.001433	.000166	.000067	.000017	
11,250	45,000	.001567	.000134	.....	.....	
12,500	50,000	.001750	.000183	.....	.....	
12,750	51,000	.001800	.000050	.....	.....	
13,000	52,000	.001850	.000050	.....	.....	
13,250	53,000	.001900	.000050	.....	.....	
13,500	54,000	.001933	.000033	.....	.....	
13,750	55,000	.001967	.000034	.....	.....	
14,000	56,000	.002000	.000033	.....	.....	
14,250	57,000	.002033	.000033	.....	.....	
14,500	58,000	.002100	.000067	.....	.....	Elastic limit.
14,750	59,000	.003167	.001067	.....	.....	
15,000	60,000	.005567	.002400	.....	.....	
15,500	62,000	.007333	.001766	.....	.....	
16,000	64,000	.008750	.001417	.....	.....	
16,500	66,000	.010333	.001583	.....	.....	
17,000	68,000	.011833	.001500	.....	.....	
17,500	70,000	.013183	.001350	.....	.....	
18,000	72,000	.014917	.001734	.....	.....	
18,500	74,000	.016683	.001766	.....	.....	
19,000	76,000	.018433	.001750	.....	.....	
19,500	78,000	.020517	.002084	.....	.....	
20,000	80,000	.022500	.001983	.....	.....	
20,500	82,000	.0250	.0025	.....	.....	
21,000	84,000	.0283	.0033	.....	.....	
21,500	86,000	.0300	.0017	.....	.....	
22,000	88,000	.0333	.0033	.....	.....	
22,500	90,000	.0367	.0034	.....	.....	
23,000	92,000	.0383	.0016	.....	.....	
23,500	94,000	.0417	.0034	.....	.....	
24,000	96,000	.0467	.0050	.....	.....	
24,500	98,000	.0517	.0050	.....	.....	
25,000	100,000	.0600	.0083	.....	.....	
25,500	102,000	.0700	.0100	.....	.....	
26,000	104,000	.0867	.0167	.....	.....	
26,060	104,240	.1050	.0183	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	104,240
Elastic limit per square inch of original section	do...	58,000
Elongation per inch after rupture	inch..	0.1400
Elongation per inch under strain at elastic limit	do...	.002100
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		2".80 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".12, ".32*, ".10, ".09, ".08

10" Steel B. L. Rifle No. 1.

Hoop A5



H Ex 31 49 2

No. 2681.

, 10 R, As
T, M
eter, ".564.
nal area, .25 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000117	.000117	0.	.....	
10,000	.000300	.000183	0.	.....	
15,000	.000467	.000167	0.	.....	
20,000	.000617	.000150	0.	.....	
25,000	.000783	.000166	0.	.....	
30,000	.000967	.000184	0.	.....	
35,000	.001133	.000166	0.	.....	
40,000	.001300	.000167	0.	.....	
45,000	.001450	.000150	.....	.....	
50,000	.001667	.000217	.....	.....	
51,000	.001683	.000016	.....	.....	
52,000	.001717	.000034	.....	.....	
53,000	.001750	.000033	.....	.....	
54,000	.001800	.000050	.....	.....	
55,000	.001833	.000033	.....	.....	Elastic limit.
56,000	.006233	.004400	.....	.....	
57,000	.006733	.000500	.....	.....	
58,000	.007617	.000884	.....	.....	
59,000	.008333	.000716	.....	.....	
60,000	.009267	.000934	.....	.....	
62,000	.011167	.001900	.....	.....	
64,000	.012750	.001583	.....	.....	
66,000	.014667	.001917	.....	.....	
68,000	.016333	.001666	.....	.....	
70,000	.018333	.002000	.....	.....	
72,000	.020500	.002167	.....	.....	
74,000	.022500	.002000	.....	.....	
76,000	.025000	.002500	.....	.....	
78,000	.027500	.002500	.....	.....	
80,000	.030200	.002700	.....	.....	
82,000	.0333	.0031	.....	.....	
84,000	.0358	.0025	.....	.....	
86,000	.0400	.0042	.....	.....	
88,000	.0450	.0050	.....	.....	
90,000	.0500	.0050	.....	.....	
92,000	.0567	.0067	.....	.....	
94,000	.0667	.0100	.....	.....	
96,000	.0800	.0133	.....	.....	
97,840	.1133	.0333	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	97,840
per square inch of original section	do...	55,000
er inch after rupture	inch..	0.1667
er inch under strain at elastic limit	do...	.001833
diameter at point of rupture	do...	.164
area after rupture, per centum of original section		49.7
upture	3¼ inches from neck	
broken surface	silky	
f inch sections	".07, ".11, ".38*, ".20, ".14, ".10	

No. 2777.

Marks, $^{10}\frac{B_1 A_5}{T_2 I}$
Diameter, ".564.
Sectional area, .25 square inch.

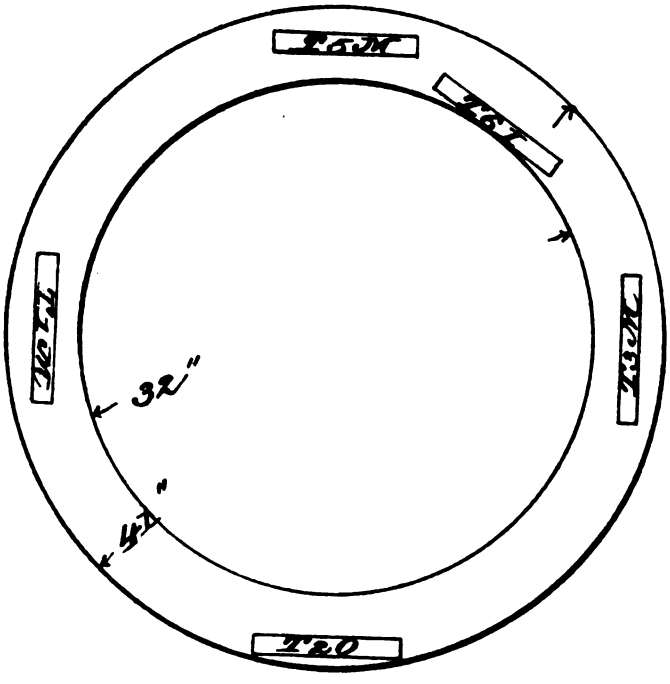
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	R
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial l
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000583	.000150	0.	.....	
6,250	25,000	.000750	.000167	0.	.....	
7,500	30,000	.000933	.000183	0.	.....	
8,750	35,000	.001083	.000150	0.	.....	
10,000	40,000	.001233	.000150	0.	.....	
11,250	45,000	.001400	.000167	0.	.....	
12,500	50,000	.001583	.000183	0.	.....	
12,750	51,000	.001617	.000034	.....	.....	
13,000	52,000	.001650	.000033	.....	.....	
13,250	53,000	.001683	.000033	.....	.....	
13,500	54,000	.001717	.000034	.....	.....	
13,750	55,000	.001750	.000033	.....	.....	
14,000	56,000	.001783	.000033	.....	.....	
14,250	57,000	.001817	.000034	.....	.....	
14,500	58,000	.001867	.000050	.....	.....	
14,750	59,000	.001900	.000033	.....	.....	Elastic l
15,000	60,000	.002500	.000600	.....	.....	
15,500	62,000	.005833	.003333	.....	.....	
16,000	64,000	.007250	.001417	.....	.....	
16,500	66,000	.008933	.001683	.....	.....	
17,000	68,000	.010450	.001517	.....	.....	
17,500	70,000	.012167	.001717	.....	.....	
18,000	72,000	.013833	.001666	.....	.....	
18,500	74,000	.015700	.001867	.....	.....	
19,000	76,000	.017667	.001967	.....	.....	
19,500	78,000	.019333	.001666	.....	.....	
20,000	80,000	.021333	.002000	.....	.....	
20,500	82,000	.023667	.002334	.....	.....	
21,000	84,000	.026000	.002333	.....	.....	
21,500	86,000	.028367	.002367	.....	.....	
22,000	88,000	.031167	.002800	.....	.....	
22,500	90,000	.0333	.002133	.....	.....	
23,000	92,000	.0367	.0034	.....	.....	
23,500	94,000	.0417	.0050	.....	.....	
24,000	96,000	.0467	.0050	.....	.....	
24,500	98,000	.0533	.0066	.....	.....	
25,000	100,000	.0600	.0067	.....	.....	
25,500	102,000	.0683	.0083	.....	.....	
26,000	104,000	.0883	.0200	.....	.....	
26,190	104,760	.1133	.0250	.....	.....	Tensile

General summary.

Specific gravity.....
Hardness.....
Tensile strength per square inch of original section.....
Elastic limit per square inch of original section.....
Elongation per inch after rupture.....
Elongation per inch under strain at elastic limit.....
Reduction in diameter at point of rupture.....
Reduction in area after rupture, per centum of original section.....
Position of rupture.....
Character of broken surface.....
Elongation of inch sections.....".16, ".31*

10" Steel B. L. Rifle No. 1

Hoop B 2



H Ex 31 49 2

No. 2602.

s, $^{10}R_1B_2$ T_1M
eter, ".564.
nal area, .25 square inch.

ied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000167	.000167	.....	.....	
10,000	.000333	.000166	.....	.....	
15,000	.000450	.000117	.....	.....	
20,000	.000633	.000183	.000017	.000017	
25,000	.000800	.000167	.000017	0.	
30,000	.000983	.000183	.000017	0.	
35,000	.001150	.000167	.000017	0.	
40,000	.001300	.000150	.000017	0.	
45,000	.001467	.000167	.000017	0.	
50,000	.001617	.000150	.....	.....	
51,000	.001650	.000033	.....	.....	
52,000	.001683	.000033	.....	.....	
53,000	.001717	.000034	.....	.....	
54,000	.001733	.000016	.....	.....	
55,000	.001783	.000050	.000017	0.	
56,000	.001817	.000034	.....	.....	
57,000	.001850	.000033	.....	.....	
58,000	.001883	.000033	.....	.....	
59,000	.001933	.000050	.....	.....	
60,000	.001983	.000050	.000033	.000016	
61,000	.002017	.000034	.....	.....	
62,000	.002050	.000033	.....	.....	Elastic limit.
63,000	.010350	.008300	.....	.....	
64,000	.010683	.000333	.....	.....	
66,000	.012333	.001650	.....	.....	
68,000	.014000	.001667	.....	.....	
70,000	.015283	.001283	.....	.....	
72,000	.016417	.001134	.....	.....	
74,000	.018083	.001666	.....	.....	
76,000	.020000	.001917	.....	.....	
78,000	.021833	.001833	.....	.....	
80,000	.023917	.002084	.....	.....	
82,000	.025833	.001916	.....	.....	
84,000	.028083	.002250	.....	.....	
86,000	.030417	.002334	.....	.....	
88,000	.0333	.002883	.....	.....	
90,000	.0367	.0034	.....	.....	
92,000	.0400	.0033	.....	.....	
94,000	.0450	.0050	.....	.....	
96,000	.0500	.0050	.....	.....	
98,000	.0550	.0050	.....	.....	
100,000	.0616	.0067	.....	.....	
102,000	.0683	.0066	.....	.....	
104,000	.0817	.0134	.....	.....	
106,000	.1067	.0250	.....	.....	
106,280	.1283	.0216	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	106,280
per square inch of original section	do...	62,000
er inch after rupture	inch..	0.1600
er inch under strain at elastic limit	do...	.002050
diameter at point of rupture	do...	.134
area after rupture, per centum of original section		41.9
ipture		2 inches from neck
broken surface		silky
'inch sections		".10, ".11, ".12, ".16, ".33*, ".14

No. 2603.

Marks, $^{10}\frac{R_1 B_2}{T_2 O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000250	.000150	0.	.....	
3,750	15,000	.000417	.000167	0.	.....	
5,000	20,000	.000583	.000166	0.	.....	
6,250	25,000	.000767	.000184	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001250	.000150	0.	.....	
11,250	45,000	.001400	.000150	0.	.....	
12,500	50,000	.001567	.000167	0.	.....	
12,750	51,000	.001600	.000033	.....	.....	
13,000	52,000	.001633	.000033	.....	.....	
13,250	53,000	.001683	.000050	.....	.....	
13,500	54,000	.001750	.000067	.....	.....	
13,750	55,000	.001783	.000033	.....	.....	
14,000	56,000	.001817	.000034	.....	.....	
14,250	57,000	.001833	.000016	.....	.....	
14,500	58,000	.001867	.000034	.....	.....	
14,750	59,000	.001900	.000033	.....	.....	
15,000	60,000	.001933	.000033	.....	.....	
15,250	61,000	.001950	.000017	.....	.....	
15,500	62,000	.002000	.000050	.....	.....	
15,750	63,000	.002033	.000033	.....	.....	
16,000	64,000	.002067	.000034	.....	.....	
16,250	65,000	.002100	.000033	.....	.....	
16,500	66,000	.002150	.000050	.....	.....	Elastic limit.
16,750	67,000	.004917	.002767	.....	.....	
17,000	68,000	.007533	.002616	.....	.....	
17,500	70,000	.008333	.000800	.....	.....	
18,000	72,000	.009833	.001500	.....	.....	
18,500	74,000	.011117	.001284	.....	.....	
19,000	76,000	.012500	.001383	.....	.....	
19,500	78,000	.013700	.001200	.....	.....	
20,000	80,000	.015333	.001633	.....	.....	
20,500	82,000	.016833	.001500	.....	.....	
21,000	84,000	.018333	.001500	.....	.....	
21,500	86,000	.020000	.001667	.....	.....	
22,000	88,000	.021833	.001833	.....	.....	
22,500	90,000	.023800	.001967	.....	.....	
23,000	92,000	.025667	.001867	.....	.....	
23,500	94,000	.028083	.002416	.....	.....	
24,000	96,000	.030000	.001917	.....	.....	
24,500	98,000	.0333	.0033	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0433	.0033	.....	.....	
26,500	106,000	.0467	.0034	.....	.....	
27,000	108,000	.0517	.0050	.....	.....	
27,500	110,000	.0567	.0050	.....	.....	
28,000	112,000	.0667	.0100	.....	.....	
28,500	114,000	.0817	.0150	.....	.....	
28,790	115,160	.1117	.0300	.....	.....	Tensile strength

General summary.

Tensile strength per square inch of original section.....pounds
Elastic limit per square inch of original section.....do.
Elongation per inch after rupture.....inch
Elongation per inch under strain at elastic limit.....do.
Reduction in diameter at point of rupture.....do.
Reduction in area after rupture, per centum of original section.....
Position of rupture.....".05 from midd
Character of broken surface.....silky; interspersed with fine g
Elongation of inch sections.....".06, ".09, ".22*, ".26

No. 2604.

18, $^{10}\,R_1\,B_2$ / $T_2\,M$
ieter, ″.565.
onal area, .25 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
	Per square inch.					
s.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
	1,000	0.	0.	0.	0.	Initial load.
	5,000	.000117	.000117	0.	.....	
	10,000	.000283	.000166	0.	.....	
	15,000	.000450	.000167	0.	.....	
	20,000	.000617	.000167	0.	.....	
	25,000	.000767	.000150	0.	.....	
	30,000	.000933	.000166	0.	.....	
	35,000	.001083	.000150	0.	.....	
	40,000	.001233	.000150	0.	.....	
	45,000	.001400	.000167	0.	.....	
	50,000	.001567	.000167	0.	.....	
	55,000	.001733	.000166	.....	.....	
	56,000	.001767	.000034	.....	.....	
	57,000	.001800	.000033	.....	.....	
	58,000	.001867	.000067	.....	.....	
	59,000	.001883	.000016	.....	.....	
	60,000	.001917	.000034	.....	.....	
	61,000	.001933	.000016	.....	.....	
	62,000	.001967	.000034	.....	.....	
	63,000	.002000	.000033	.....	.....	
	64,000	.002067	.000067	.....	.....	
	65,000	.002100	.000033	.....	.....	Elastic limit.
	66,000	.004750	.002650	.....	.....	
	68,000	.009167	.004417	.....	.....	
	70,000	.010200	.001033	.....	.....	
	72,000	.011500	.001300	.....	.....	
	74,000	.012833	.001333	.....	.....	
	76,000	.014333	.001500	.....	.....	
	78,000	.015833	.001500	.....	.....	
	80,000	.017333	.001500	.....	.....	
	82,000	.019000	.001667	.....	.....	
	84,000	.020750	.001750	.....	.....	
	86,000	.022333	.001583	.....	.....	
	88,000	.024167	.001834	.....	.....	
	90,000	.026000	.001833	.....	.....	
	92,000	.028083	.002083	.....	.....	
	94,000	.030667	.002584	.....	.....	
	96,000	.0333	.002633	.....	.....	
	98,000	.0367	.0034	.....	.....	
	100,000	.0383	.0016	.....	.....	
	102,000	.0417	.0034	.....	.....	
	104,000	.0467	.0050	.....	.....	
	106,000	.0533	.0066	.....	.....	
	108,000	.0600	.0067	.....	.....	
	110,000	.0700	.0100	.....	.....	
	112,000	.0800	.0100	.....	.....	
	113,680	.1233	.0433	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds..	113,680
it per square inch of original section	do...	65,000
per inch after rupture	inch..	0.1467
per inch under strain at elastic limit	do...	.002100
in diameter at point of rupture	do...	.085
a area after rupture, per centum of original section		27.6
rupture		1″.90 from neck
f broken surface	silky center; fine granular at circumference	
of inch sections		″.12, ″.28*, ″.15, ″.13, ″.12, ″.08

No. 2743.

Marks, $^{10}\,{}^{R_1\,B_2}_{T_3\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000300	.000183	0.	.....	
3,750	15,000	.000433	.000133	0.	.....	
5,000	20,000	.000633	.000200	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000983	.000183	0.	.....	
8,750	35,000	.001133	.000150	0.	.....	
10,000	40,000	.001317	.000184	0.	.....	
11,250	45,000	.001467	.000150	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001567	.000034	.....	.....	
12,250	49,000	.001617	.000050	.....	.....	
12,500	50,000	.001667	.000050	.....	.....	
12,750	51,000	.001683	.000016	.....	.....	
13,000	52,000	.001717	.000034	.....	.....	
13,250	53,000	.001750	.000033	.....	.....	
13,500	54,000	.001783	.000033	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	
14,000	56,000	.001867	.000050	.....	.....	
14,250	57,000	.001883	.000016	.....	.....	
14,500	58,000	.001950	.000067	.....	.....	
14,750	59,000	.001983	.000033	.....	.....	
15,000	60,000	.002017	.000034	.....	.....	
15,250	61,000	.002050	.000033	.....	.....	Elastic limit.
15,500	62,000	.006000	.003950	.....	.....	
16,000	64,000	.010333	.004333	.....	.....	
16,500	66,000	.011017	.000684	.....	.....	
17,000	68,000	.012500	.001483	.....	.....	
17,500	70,000	.013833	.001333	.....	.....	
18,000	72,000	.015333	.001500	.....	.....	
18,500	74,000	.017000	.001667	.....	.....	
19,000	76,000	.018500	.001500	.....	.....	
19,500	78,000	.020000	.001500	.....	.....	
20,000	80,000	.022000	.002000	.....	.....	
20,500	82,000	.023833	.001833	.....	.....	
21,000	84,000	.025833	.002000	.....	.....	
21,500	86,000	.0283	.002467	.....	.....	
22,000	88,000	.0317	.0034	.....	.....	
22,500	90,000	.0333	.0016	.....	.....	
23,000	92,000	.0350	.0017	.....	.....	
23,500	94,000	.0383	.0033	.....	.....	
24,000	96,000	.0417	.0034	.....	.....	
24,500	98,000	.0467	.0050	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0667	.0100	.....	.....	
26,500	106,000	.0767	.0100	.....	.....	
27,000	108,000	.0950	.0183	.....	.....	
27,160	108,640	.1183	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds.
Elastic limit per square inch of original section ..... do.
Elongation per inch after rupture ..... inch.
Elongation per inch under strain at elastic limit ..... do.
Reduction in diameter at point of rupture ..... do.
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... 1″.20
Character of broken surface .....
Elongation of inch sections ..... ″.20*, ″.26*, ″.14, ″.11

No. 2744.

, 10 R, B₂
, T₆ I
ter, ".564.
nal area, .25 square inch.

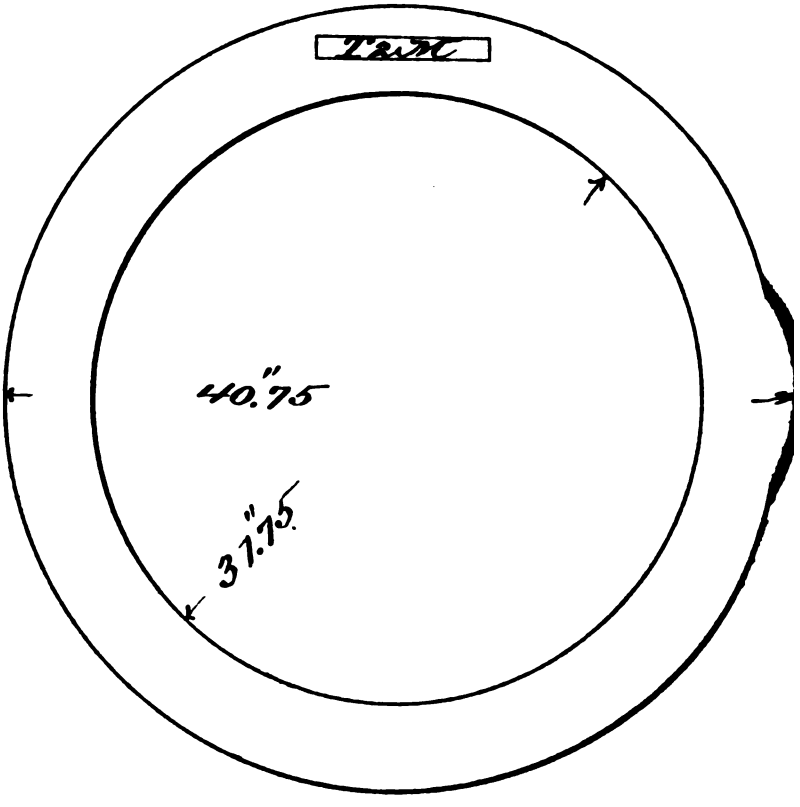
ied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load
5,000	.000133	.000133	0.	.....	
10,000	.000317	.000184	0.	.....	
15,000	.000467	.000150	0	.....	
20,000	.000633	.000166	0.	.....	
25,000	.000800	.000167	0.	.....	
30,000	.000967	.000167	0.	.....	
35,000	.001133	.000166	0.	.....	
40,000	.001333	.000200	0.	.....	
45,000	.001483	.000150	0.	.....	
50,000	.001667	.000184	0.	.....	
51,000	.001700	.000033	.....	.....	
52,000	.001733	.000033	.....	.....	
53,000	.001767	.000034	.....	.....	
54,000	.001800	.000033	.....	.....	
55,000	.001833	.000033	.....	.....	
56,000	.001867	.000034	.....	.....	
57,000	.001883	.000016	.....	.....	
58,000	.001933	.000050	.....	.....	
59,000	.001967	.000034	.....	.....	
60,000	.002017	.000050	.....	.....	
61,000	.002033	.000016	.....	.....	
62,000	.002083	.000050	.....	.....	
63,000	.002117	.000034	.....	.....	
64,000	.002167	.000050	.....	.....	
65,000	.002200	.000033	.....	.....	Elastic limit.
66,000	.002500	.000300	.....	.....	
67,000	.002683	.000183	.....	.....	
68,000	.005200	.002517	.....	.....	
70,000	.007033	.001833	.....	.....	
72,000	.008667	.001634	.....	.....	
74,000	.010750	.002083	.....	.....	
76,000	.012333	.001583	.....	.....	
78,000	.013667	.001334	.....	.....	
80,000	.015000	.001333	.....	.....	
82,000	.016667	.001667	.....	.....	
84,000	.018333	.001666	.....	.....	
86,000	.020000	.001667	.....	.....	
88,000	.021833	.001833	.....	.....	
90,000	.024167	.002334	.....	.....	
92,000	.026000	.001833	.....	.....	
94,000	.028000	.002000	.....	.....	
96,000	.0300	.0020	.....	.....	
98,000	.0333	.0033	.....	.....	
100,000	.0367	.0034	.....	.....	
102,000	.0383	.0016	.....	.....	
104,000	.0433	.0050	.....	.....	
106,000	.0483	.0050	.....	.....	
108,000	.0517	.0034	.....	.....	
110,000	.0600	.0083	.....	.....	
112,000	.0717	.0117	.....	.....	
113,920	.0917	.0200	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	113,920
per square inch of original section	do...	65,000
per inch after rupture	inch..	0.1150
per inch under strain at elastic limit	do...	.002200
diameter at point of rupture	do...	.114
area after rupture, per centum of original section		36.4
rupture		".95 from neck; oblique
broken surface		silky; traces of granulation
f inch sections		".26*, ".13, ".07, ".06, ".08, ".09

10" Steel B.L. Rifle No. 1.

Hoop B3



H Ex 31 492

No. 2775.

ks, 10 $\frac{R_1 B_2}{T_2 M}$
neter, ″.564.
ional area, .25 square inch.

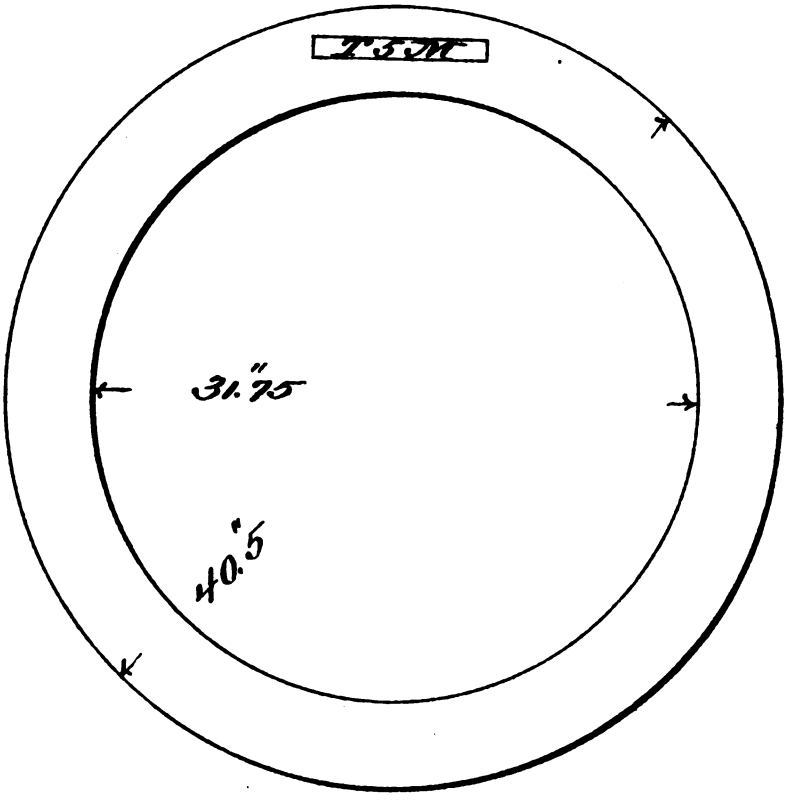
plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
L.	Per square inch.					
ls.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000100	.000100	0.	.....	
0	10,000	.000267	.000167	0.	.....	
0	15,000	.000433	.000166	0.	.....	
0	20,000	.000583	.000150	0.	.....	
0	25,000	.000750	.000167	0.	.....	
0	30,000	.000917	.000167	0.	.....	
0	35,000	.001083	.000166	0.	.....	
0	40,000	.001233	.000150	—.000033	—.000033	
0	45,000	.001400	.000167	.....	.....	
0	50,000	.001567	.000167	.....	.....	
0	51,000	.001600	.000033	.....	.....	
0	52,000	.001650	.000050	.....	.....	
0	53,000	.001683	.000033	.....	.....	Elastic limit.
0	54,000	.002367	.000684	.....	.....	
0	55,000	.004283	.001916	.....	.....	
0	56,000	.006000	.001717	.....	.....	
0	57,000	.007500	.001500	.....	.....	
0	58,000	.008000	.000500	.....	.....	
0	59,000	.008583	.000583	.....	.....	
00	60,000	.009417	.000834	.....	.....	
00	62,000	.011133	.001716	.....	.....	
00	64,000	.012783	.001650	.....	.....	
00	66,000	.014500	.001717	.....	.....	
00	68,000	.016333	.001833	.....	.....	
00	70,000	.018167	.001834	.....	.....	
00	72,000	.020200	.002033	.....	.....	
00	74,000	.022500	.002300	.....	.....	
00	76,000	.024417	.001917	.....	.....	
00	78,000	.026667	.002250	.....	.....	
00	80,000	.0300	.003333	.....	.....	
00	82,000	.0333	.0033	.....	.....	
00	84,000	.0350	.0017	.....	.....	
00	86,000	.0383	.0033	.....	.....	
00	88,000	.0450	.0067	.....	.....	
00	90,000	.0500	.0050	.....	.....	
00	92,000	.0550	.0050	.....	.....	
00	94,000	.0667	.0117	.....	.....	
00	96,000	.0800	.0133	.....	.....	
00	98,000	.1067	.0267	.....	.....	
00	98,320	.1200	.0133	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	98,320
mit per square inch of original section	do ..	53,000
on per inch after rupture	inch..	0.1817
on per inch under strain at elastic limit	do...	.001683
n in diameter at point of rupture	do...	.154
n in area after rupture, per centum of original section		47.2
of rupture		1″.23 from neck
r of broken surface		silky
on of inch sections		″.10, ″.13, ″.15, ″.16, ″.32*, ″.23*

10" Steel B. L. Rifle No. 1.

Hoop B 4



H Ex 31 49 2

No. 2682.

Marks, $\frac{10\ R_1\ B_4}{T_5\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

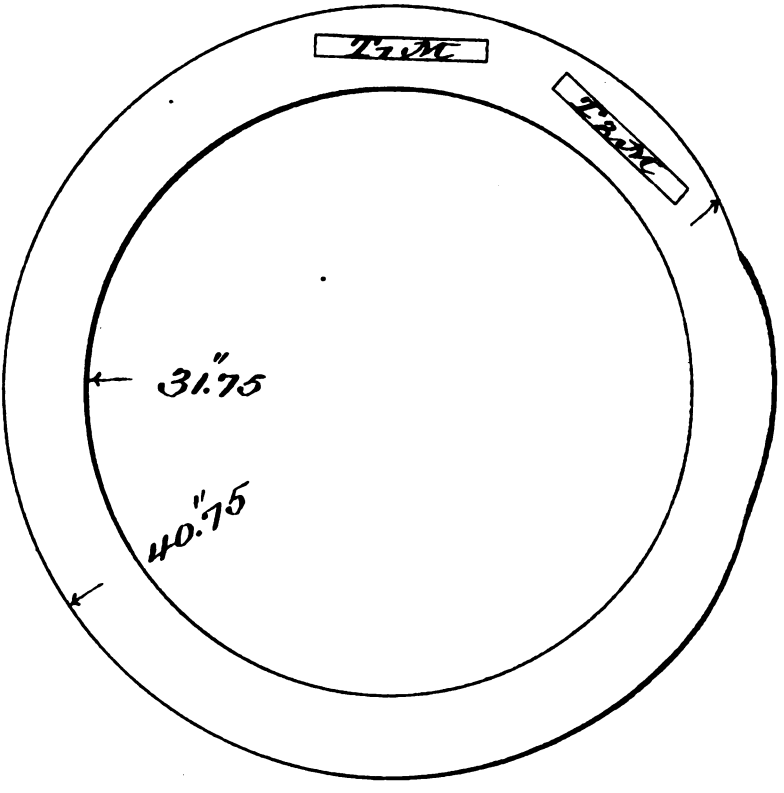
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000467	.000184	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.001000	.000183	0.	.....	
8,750	35,000	.001183	.000183	0.	.....	
10,000	40,000	.001350	.000167	0.	.....	
11,250	45,000	.001500	.000150	.....	.....	
12,500	50,000	.001683	.000183	.....	.....	
12,750	51,000	.001700	.000017	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001817	.000050	.....	.....	
13,750	55,000	.001850	.000033	.....	.....	
14,000	56,000	.001900	.000050	.....	.....	
14,250	57,000	.001933	.000033	.....	.....	
14,500	58,000	.001950	.000017	.....	.....	
14,750	59,000	.002000	.000050	.....	.....	
15,000	60,000	.002050	.000050	.....	.....	
15,250	61,000	.002100	.000050	.....	.....	Elastic limit.
15,500	62,000	.002217	.000117	.....	.....	
15,750	63,000	.002383	.000166	.....	.....	
16,000	64,000	.002717	.000334	.....	.....	
16,250	65,000	.003667	.000950	.....	.....	
16,500	66,000	.005783	.002116	.....	.....	
17,000	68,000	.007667	.001884	.....	.....	
17,500	70,000	.009283	.001616	.....	.....	
18,000	72,000	.010950	.001667	.....	.....	
18,500	74,000	.012533	.001583	.....	.....	
19,000	76,000	.014333	.001800	.....	.....	
19,500	78,000	.016000	.001667	.....	.....	
20,000	80,000	.018000	.002000	.....	.....	
20,500	82,000	.019833	.001833	.....	.....	
21,000	84,000	.022000	.002167	.....	.....	
21,500	86,000	.024167	.002167	.....	.....	
22,000	88,000	.026517	.002350	.....	.....	
22,500	90,000	.028917	.002400	.....	.....	
23,000	92,000	.0317	.002783	.....	.....	
23,500	94,000	.0350	.0033	.....	.....	
24,000	96,000	.0367	.0017	.....	.....	
24,500	98,000	.0417	.0050	.....	.....	
25,000	100,000	.0467	.0050	.....	.....	
25,500	102,000	.0533	.0066	.....	.....	
26,000	104,000	.0617	.0084	.....	.....	
26,500	106,000	.0717	.0100	.....	.....	
27,000	108,000	.1033	.0316	.....	.....	
27,030	108,120	.1117	.0084	.....	.....	Tensile strength.

General summary.

Specific gravity		7.8432
Hardness		24.26
Tensile strength per square inch of original section	pounds	108,120
Elastic limit per square inch of original section	do	61,000
Elongation per inch after rupture	inch	0.1650
Elongation per inch under strain at elastic limit	do	.002100
Reduction in diameter at point of rupture	do	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		1″.20 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.15, ″.11, ″.10, ″.21, ″.38*

10" Steel B.L. Rifle No. 2

Hoop B5



H Ex 31 49 2

No. 2679.

rks, $^{10}\,R_1\,B_6\,T_1\,M$

meter, ".564.

tional area, .25 square inch.

pplied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
al.	Per square inch.					
nds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
250	5,000	.000100	.000100	0.	.....	
500	10,000	.000267	.000167	0.	.....	
750	15,000	.000450	.000183	0.	.....	
000	20,000	.000600	.000150	0.	.....	
250	25,000	.000767	.000167	0.	.....	
500	30,000	.000933	.000166	0.	.....	
750	35,000	.001100	.000167	0.	.....	
000	40,000	.001267	.000167	0.	.....	
250	45,000	.001433	.000166	.....	.....	
500	50,000	.001633	.000200	.....	.....	
750	51,000	.001683	.000050	.....	.....	
000	52,000	.001733	.000050	.....	.....	
250	53,000	.001750	.000017	.....	.....	
500	54,000	.001800	.000050	.....	.....	Elastic limit.
750	55,000	.001900	.000100	.....	.....	
000	56,000	.002333	.000433	.....	.....	
250	57,000	.002833	.000500	.....	.....	
500	58,000	.003833	.001000	.....	.....	
750	59,000	.006333	.002500	.....	.....	
000	60,000	.007417	.001084	.....	.....	
500	62,000	.008383	.000966	.....	.....	
000	64,000	.010000	.001617	.....	.....	
500	66,000	.011667	.001667	.....	.....	
,000	68,000	.013333	.001666	.....	.....	
,500	70,000	.015033	.001700	.....	.....	
,000	72,000	.016833	.001800	.....	.....	
,500	74,000	.018917	.002084	.....	.....	
,000	76,000	.021000	.002083	.....	.....	
,500	78,000	.023000	.002000	.....	.....	
,000	80,000	.0250	.0020	.....	.....	
,500	82,000	.0283	.0033	.....	.....	
,000	84,000	.0317	.0034	.....	.....	
,500	86,000	.0350	.0033	.....	.....	
,000	88,000	.0367	.0017	.....	.....	
,500	90,000	.0383	.0016	.....	.....	
,000	92,000	.0450	.0067	.....	.....	
,500	94,000	.0500	.0050	.....	.....	
000	96,000	.0550	.0050	.....	.....	
500	98,000	.0633	.0083	.....	.....	
000	100,000	.0767	.0134	.....	.....	
500	102,000	{ .1050 { .1250	.0283 } .0200 }	.....	.....	Tensile strength.

General summary.

strength per square inch of original section	pounds..	102,000
limit per square inch of original section	do...	54,000
ion per inch after rupture	inch..	0.1583
ion per inch under strain at elastic limit	do...	.001800
on in diameter at point of rupture	do...	.144
on in area after rupture, per centum of original section		44.6
of rupture		".65 from neck
er of broken surface		silky
ion of inch sections		".12, ".12, ".11, ".12, ".12, ".32*

No. 2695.

Marks, $^{10\,R_1\,B_5}_{T_2\,M}$
Diameter, ".564.
Sectional area, .25 square inch.

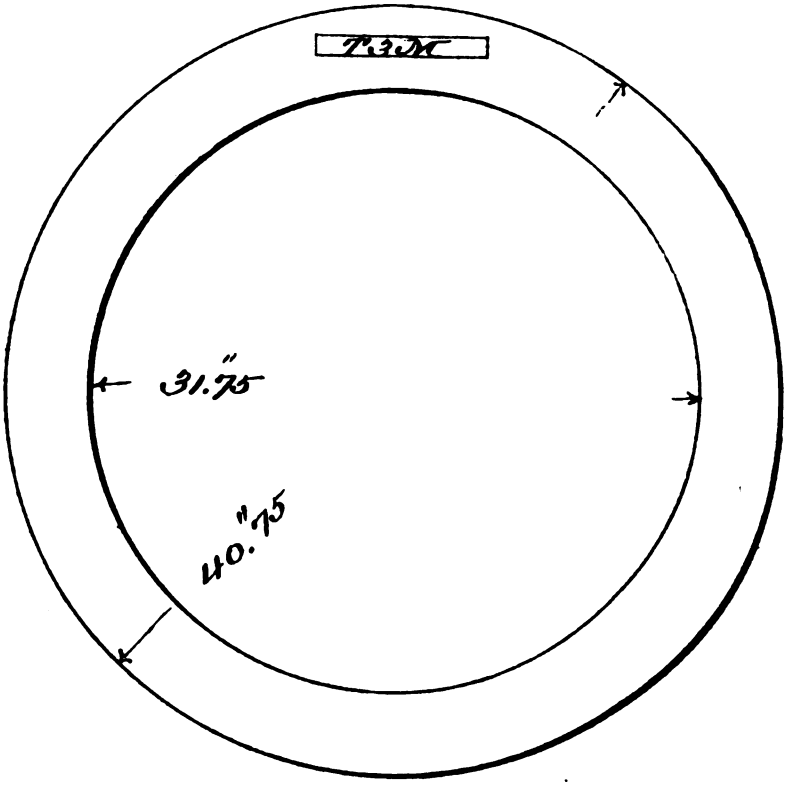
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remark
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000483	.000183	0.	.....	
5,000	20,000	.000667	.000184	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001017	.000184	.000017	.000017	
8,750	35,000	.001183	.000166	.000017	0.	
10,000	40,000	.001350	.000167	.000017	0.	
11,250	45,000	.001500	.000150	.....	.....	
12,500	50,000	.001683	.000183	.....	.....	
12,750	51,000	.001717	.000034	.....	.....	
13,000	52,000	.001733	.000016	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001817	.000050	.....	.....	
13,750	55,000	.001867	.000050	.....	.....	
14,000	56,000	.001883	.000016	.....	.....	
14,250	57,000	.001950	.000067	.....	.....	Elastic limit.
14,500	58,000	.002033	.000083	.....	.....	
14,750	59,000	.002317	.000284	.....	.....	
15,000	60,000	.003533	.001216	.....	.....	
15,500	62,000	.004917	.001384	.....	.....	
16,000	64,000	.006500	.001583	.....	.....	
16,500	66,000	.008167	.001667	.....	.....	
17,000	68,000	.009667	.001500	.....	.....	
17,500	70,000	.011500	.001833	.....	.....	
18,000	72,000	.013017	.001517	.....	.....	
18,500	74,000	.014867	.001850	.....	.....	
19,000	76,000	.016500	.001633	.....	.....	
19,500	78,000	.018117	.001617	.....	.....	
20,000	80,000	.020000	.001883	.....	.....	
20,500	82,000	.022000	.002000	.....	.....	
21,000	84,000	.024000	.002000	.....	.....	
21,500	86,000	.026500	.002500	.....	.....	
22,000	88,000	.029167	.002667	.....	.....	
22,500	90,000	.0317	.002533	.....	.....	
23,000	92,000	.0350	.0033	.....	.....	
23,500	94,000	.0383	.0033	.....	.....	
24,000	96,000	.0417	.0034	.....	.....	
24,500	98,000	.0467	.0050	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0667	.0100	.....	.....	
26,500	106,000	.0850	.0183	.....	.....	
26,610	106,440	.1033	.0183	.....	.....	Tensile strength

General summary.

Specific gravity.....
Hardness.....
Tensile strength per square inch of original section.....pounds
Elastic limit per square inch of original section.....do.
Elongation per inch after rupture.....inch
Elongation per inch under strain at elastic limit.....do.
Reduction in diameter at point of rupture.....do.
Reduction in area after rupture, per centum of original section.....
Position of rupture.....".15 from mid
Character of broken surface.....
Elongation of inch sections.....".10, ".11, ".14, ".2

10" Steel B. L. Rifle No. 1

Hoop B 6



H Ex 31 492

No. 2745.

Marks, $^{10}\,R_1\,B_3$ $T_2\,M$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001167	.000184	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
11,250	45,000	.001500	.000167	0.	.....	
12,500	50,000	.001667	.000167	0.	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	
13,250	53,000	.001750	.000017	.....	.....	
13,500	54,000	.001783	.000033	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	
14,000	56,000	.001850	.000033	.....	.....	
14,250	57,000	.001883	.000033	.....	.....	Elastic limit.
14,500	58,000	.010000	.008117	.....	.....	
14,750	59,000	.010317	.000317	.....	.....	
15,000	60,000	.011050	.000733	.....	.....	
15,500	62,000	.012583	.001533	.....	.....	
16,000	64,000	.014250	.001667	.....	.....	
16,500	66,000	.016083	.001833	.....	.....	
17,000	68,000	.017833	.001750	.....	.....	
17,500	70,000	.020000	.002167	.....	.....	
18,000	72,000	.022333	.002333	.....	.....	
18,500	74,000	.024500	.002167	.....	.....	
19,000	76,000	.026667	.002167	.....	.....	
19,500	78,000	.029083	.002416	.....	.....	
20,000	80,000	.0317	.002617	.....	.....	
20,500	82,000	.0350	.0033	.....	.....	
21,000	84,000	.0367	.0017	.....	.....	
21,500	86,000	.0417	.0050	.....	.....	
22,000	88,000	.0483	.0066	.....	.....	
22,500	90,000	.0533	.0050	.....	.....	
23,000	92,000	.0600	.0067	.....	.....	
23,500	94,000	.0683	.0083	.....	.....	
24,000	96,000	.0833	.0150	.....	.....	
24,500	98,000	.1067	.0234	.....	.....	
24,560	98,320	.1350	.0283	.....	.....	Tensile strength.

General summary.

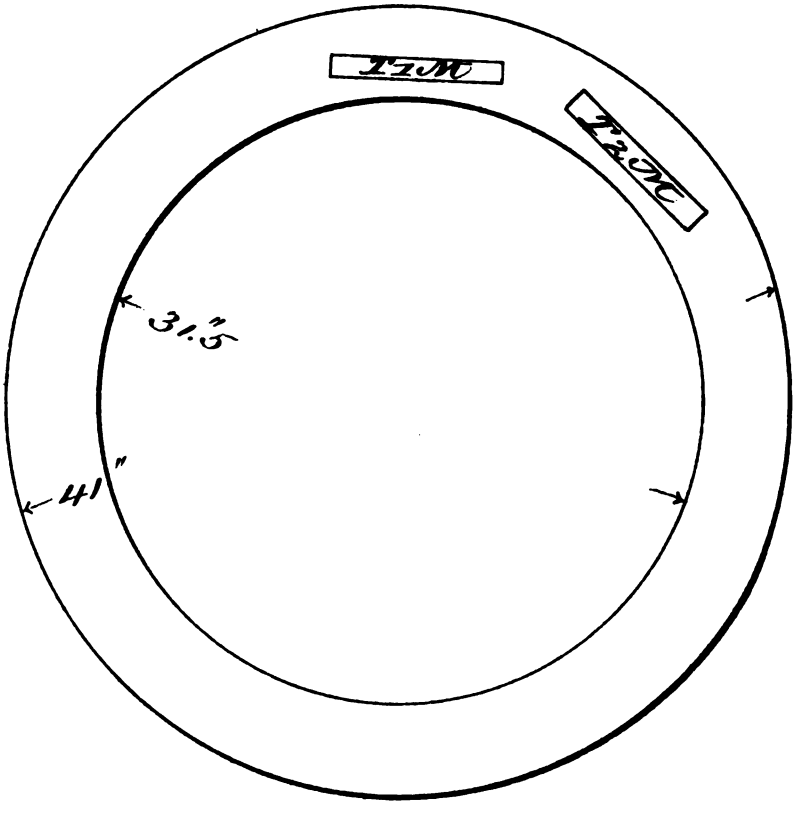
Tensile strength per square inch of original section	pounds..	98,320
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.1450
Elongation per inch under strain at elastic limit	do...	.001883
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		1".50 from neck

Character of broken surface, granular, 50 per centum; silky, 50 per centum; opened fine cracks in surface of stem.

Elongation of inch sections ....".09, ".11, ".14, ".16, ".22*, ".15

10" Steel B.L. Rifle No. 1

Hoop B7



H Ex 31 492

No. 2615.

18, $\frac{10\,R_1\,B_7}{T_1\,M}$
meter, ″.564.
ional area, .25 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
l.	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000083	.000083	0.	.....	
0	10,000	.000250	.000167	0.	.....	
0	15,000	.000417	.000167	0.	.....	
0	20,000	.000583	.000166	0.	.....	
0	25,000	.000733	.000150	0.	.....	
0	30,000	.000900	.000167	0.	.....	
0	35,000	.001067	.000167	0.	.....	
0	40,000	.001250	.000183	0.	.....	
0	45,000	.001417	.000167	.....	.....	
0	50,000	.001600	.000183	.....	.....	
0	51,000	.001633	.000033	.....	.....	
0	52,000	.001683	.000050	.....	.....	
0	53,000	.001717	.000034	.....	.....	
0	54,000	.001750	.000033	.....	.....	
0	55,000	.001783	.000033	.....	.....	
0	56,000	.001817	.000034	.....	.....	
0	57,000	.001850	.000033	.....	.....	
0	58,000	.001883	.000033	.....	.....	
0	59,000	.001917	.000034	.....	.....	
0	60,000	.001967	.000050	.....	.....	
0	61,000	.002000	.000033	.....	.....	
0	62,000	.002033	.000033	.....	.....	
0	63,000	.002083	.000050	.....	.....	Elastic limit.
0	64,000	.010167	.008084	.....	.....	
0	65,000	.010667	.000500	.....	.....	
0	66,000	.010917	.000250	.....	.....	
0	68,000	.012167	.001250	.....	.....	
0	70,000	.013667	.001500	.....	.....	
0	72,000	.015333	.001666	.....	.....	
0	74,000	.017000	.001667	.....	.....	
0	76,000	.018750	.001750	.....	.....	
0	78,000	.021083	.002333	.....	.....	
0	80,000	.0217	.000617	.....	.....	
0	82,000	.0233	.0016	.....	.....	
0	84,000	.0267	.0034	.....	.....	
0	86,000	.0300	.0033	.....	.....	
0	88,000	.0333	.0033	.....	.....	
0	90,000	.0367	.0034	.....	.....	
0	92,000	.0400	.0033	.....	.....	
0	94,000	.0433	.0033	.....	.....	
0	96,000	.0467	.0034	.....	.....	
0	98,000	.0500	.0033	.....	.....	
0	100,000	.0550	.0050	.....	.....	
0	102,000	.0667	.0117	.....	.....	
0	104,000	.0733	.0066	.....	.....	
0	106,000	.0833	.0100	.....	.....	
0	107,200	.1350	.0517	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds..	107,200
it per square inch of original section	do...	63,000
per inch after rupture	inch..	0.1783
per inch under strain at elastic limit	do...	.002083
n diameter at point of rupture	do...	.134
n area after rupture, per centum of original section		41.9
rupture		2″.05 from neck
f broken surface		silky
of inch sections		″.12, ″.36*, ″.21, ″.15, ″.13, ″.10

No. 2822.

Marks, $^{10}\,{}^{R_1\,B_7}_{T_2\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.

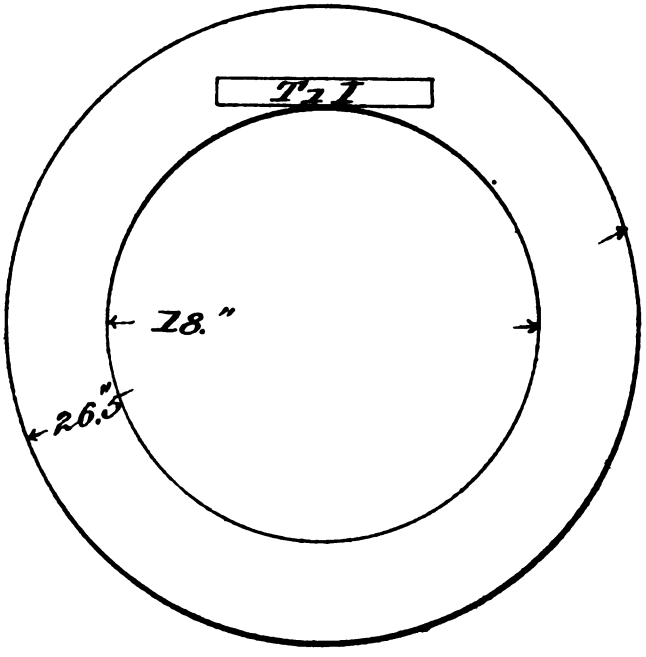
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remar
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000283	.000183	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001117	.000150	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001433	.000150	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001517	.000050	.....	.....	
12,000	48,000	.001550	.000033	.....	.....	
12,250	49,000	.001600	.000050	.....	.....	
12,500	50,000	.001633	.000033	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001717	.000034	.....	.....	
13,500	54,000	.001767	.000050	.....	.....	
13,750	55,000	.001800	.000033	.....	.....	
14,000	56,000	.001833	.000033	.....	.....	
14,250	57,000	.001867	.000034	.....	.....	
14,500	58,000	.001917	.000050	.....	.....	
14,750	59,000	.001950	.000033	.....	.....	
15,000	60,000	.001983	.000033	.....	.....	
15,250	61,000	.002017	.000034	.....	.....	
15,500	62,000	.002050	.000033	.....	.....	Elastic limit.
15,750	63,000	.002150	.000100	.....	.....	
16,000	64,000	.006667	.004517	.....	.....	
16,500	66,000	.008850	.002183	.....	.....	
17,000	68,000	.010000	.001150	.....	.....	
17,500	70,000	.011500	.001500	.....	.....	
18,000	72,000	.013000	.001500	.....	.....	
18,500	74,000	.014500	.001500	.....	.....	
19,000	76,000	.015917	.001417	.....	.....	
19,500	78,000	.017383	.001466	.....	.....	
20,000	80,000	.019167	.001784	.....	.....	
20,500	82,000	.020867	.001700	.....	.....	
21,000	84,000	.022667	.001800	.....	.....	
21,500	86,000	.024750	.002083	.....	.....	
22,000	88,000	.026867	.002117	.....	.....	
22,500	90,000	.0300	.003133	.....	.....	
23,000	92,000	.0333	.0033	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0383	.0016	.....	.....	
24,500	98,000	.0433	.0050	.....	.....	
25,000	100,000	.0467	.0034	.....	.....	
25,500	102,000	.0517	.0050	.....	.....	
26,000	104,000	.0600	.0083	.....	.....	
26,500	106,000	.0667	.0067	.....	.....	
27,000	108,000	.0800	.0133	.....	.....	
27,390	109,560	.1133	.0333	.....	.....	Tensile stren

General summary.

Specific gravity .....
Hardness .....
Tensile strength per square inch of original section ..... poun
Elastic limit per square inch of original section ..... d
Elongation per inch after rupture ..... in
Elongation per inch under strain at elastic limit ..... d
Reduction in diameter at point of rupture ..... d
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... 2½ incl
Character of broken surface .....
Elongation of inch sections ..... ″.13, ″.23, ″.47*,

10" Steel B. L. Rifle No. 1

Hoop C1



H Ex 31 492

No. 2576.

Marks, $^{10}\,{}^{R_1\,C_1}_{T_1\,I}$
Diameter, ″.564.
Sectional area, .25 square inch.

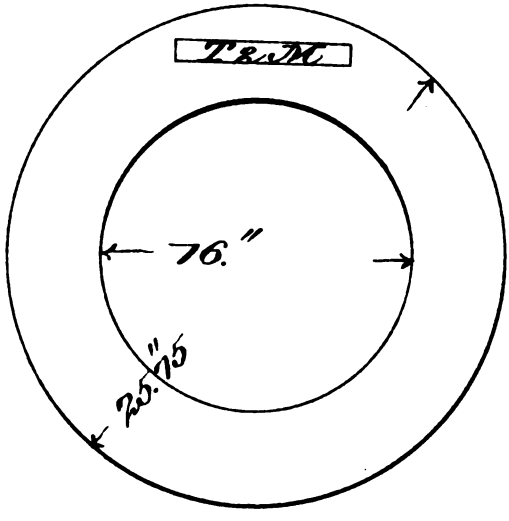
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000267	.000117	0.	.....	
3,750	15,000	.000417	.000150	0.	.....	
5,000	20,000	.000567	.000150	0.	.....	
6,250	25,000	.000750	.000183	0.	.....	
7,500	30,000	.000933	.000163	0.	.....	
8,750	35,000	.001100	.000167	.....	.....	
10,000	40,000	.001250	.000150	.....	.....	
11,250	45,000	.001433	.000163	.....	.....	
12,500	50,000	.001600	.000167	.....	.....	
12,750	51,000	.001633	.000033	.....	.....	
13,000	52,000	.001667	.000034	.....	.....	
13,250	53,000	.001700	.000033	.....	.....	
13,500	54,000	.001717	.000017	.....	.....	
13,750	55,000	.001767	.000050	.....	.....	
14,000	56,000	.001817	.000050	.....	.....	
14,250	57,000	.001850	.000033	.....	.....	
14,500	58,000	.001883	.000033	.....	.....	
14,750	59,000	.001917	.000034	.....	.....	
15,000	60,000	.001967	.000050	.....	.....	
15,250	61,000	.002000	.000033	.....	.....	
15,500	62,000	.002033	.000033	.....	.....	
15,750	63,000	.002083	.000050	.....	.....	
16,000	64,000	.002117	.000034	.....	.....	
16,250	65,000	.002150	.000033	.....	.....	
16,500	66,000	.002183	.000033	.....	.....	
16,750	67,000	.002233	.000050	.....	.....	
17,000	68,000	.002300 .013667	.000067 .011367	.....	.....	Elastic limit.
17,250	69,000	.014167	.000500	.....	.....	
17,500	70,000	.014733	.000566	.....	.....	
18,000	72,000	.016500	.001767	.....	.....	
18,500	74,000	.017833	.001333	.....	.....	
19,000	76,000	.019583	.001750	.....	.....	
19,500	78,000	.0208	.001217	.....	.....	
20,000	80,000	.0233	.0025	.....	.....	
20,500	82,000	.0250	.0017	.....	.....	
21,000	84,000	.0267	.0017	.....	.....	
21,500	86,000	.0283	.0016	.....	.....	
22,000	88,000	.0333	.0050	.....	.....	
22,500	90,000	.0350	.0017	.....	.....	
23,000	92,000	.0383	.0033	.....	.....	
23,500	94,000	.0417	.0034	.....	.....	
24,000	96,000	.0450	.0033	.....	.....	
24,500	98,000	.0483	.0033	.....	.....	
25,500	100,000	.0517	.0034	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0650	.0083	.....	.....	
26,500	106,000	.0800	.0150	.....	.....	
27,000	108,000	.1067	.0267	.....	.....	
27,180	108,720	.1283	.0216	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	108,720
Elastic limit per square inch of original section	do...	68,000
Elongation per inch after rupture	inch..	0.1550
Elongation per inch under strain at elastic limit	do...	.002300
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		″.2 from middle of stem; oblique
Character of broken surface		silky
Elongation of inch sections		″10, ″.13, ″.31*, ″.19, ″.12, ″.08

10" Steel B. L. Rifle No.

New Hoop C 1



H Ex 31 49 2

No. 2680.

Marks, $^{10\,R_1\,C_1}_{T_2\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.

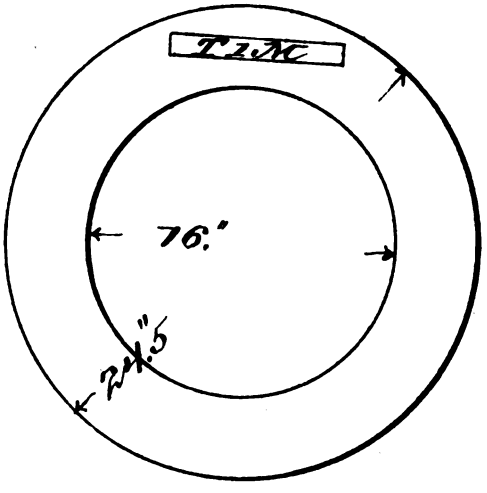
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000283	.000183	0.	.....	
3,750	15,000	.000483	.000200	0.	.....	
5,000	20,000	.000633	.000150	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000950	.000150	0.	.....	
8,750	35,000	.001133	.000183	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001617	.000150	.....	.....	
12,750	51,000	.001650	.000033	.....	.....	
13,000	52,000	.001700	.000050	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001750	.000017	.....	.....	
13,750	55,000	.001800	.000050	.....	.....	
14,000	56,000	.001817	.000017	.....	.....	
14,250	57,000	.001867	.000050	.....	.....	
14,500	58,000	.001900	.000033	.....	.....	
14,750	59,000	.001933	.000033	.....	.....	
15,000	60,000	.001950	.000017	.....	.....	
15,250	61,000	.002000	.000050	.....	.....	
15,500	62,000	.002033	.000033	.....	.....	
15,750	63,000	.002083	.000050	.....	.....	
16,000	64,000	.002133	.000050	.....	.....	Elastic limit.
16,250	65,000	.003667	.001534	.....	.....	
16,500	66,000	.006500	.002833	.....	.....	
17,000	68,000	.008333	.001833	.....	.....	
17,500	70,000	.010000	.001667	.....	.....	
18,000	72,000	.011517	.001517	.....	.....	
18,500	74,000	.012833	.001316	.....	.....	
19,000	76,000	.014283	.001450	.....	.....	
19,500	78,000	.015967	.001684	.....	.....	
20,000	80,000	.017433	.001466	.....	.....	
20,500	82,000	.019583	.002150	.....	.....	
21,000	84,000	.021333	.001750	.....	.....	
21,500	86,000	.023333	.002000	.....	.....	
22,000	88,000	.0250	.001667	.....	.....	
22,500	90,000	.0283	.0033	.....	.....	
23,000	92,000	.0317	.0034	.....	.....	
23,500	94,000	.0350	.0033	.....	.....	
24,000	96,000	.0367	.0017	.....	.....	
24,500	98,000	.0383	.0016	.....	.....	
25,000	100,000	.0433	.0050	.....	.....	
25,500	102,000	.0467	.0034	.....	.....	
26,000	104,000	.0517	.0050	.....	.....	
26,500	106,000	.0617	.0100	.....	.....	
27,000	108,000	.0717	.0100	.....	.....	
27,500	110,000	.1017	.0300	.....	.....	
27,510	110,040	.1117	.0100	.....	.....	Tensile strength.

General summary.

Specific gravity		7.8376
Hardness		24.83
Tensile strength per square inch of original section	pounds	110,040
Elastic limit per square inch of original section	do	64,000
Elongation per inch after rupture	inch	0.1550
Elongation per inch under strain at elastic limit	do	.002133
Reduction in diameter at point of rupture	do	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		2″.50 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.10, ″.20, ″.32*, ″.12, ″.10, .509

10" Steel B.L. Rifle No.

Hoop C2



H Ex 31 492

No. 2778.

Marks, $^{10}\,R_1\,C_2$ / $T_1\,M$

Diameter, ".564.

Sectional area, .25 square inch.

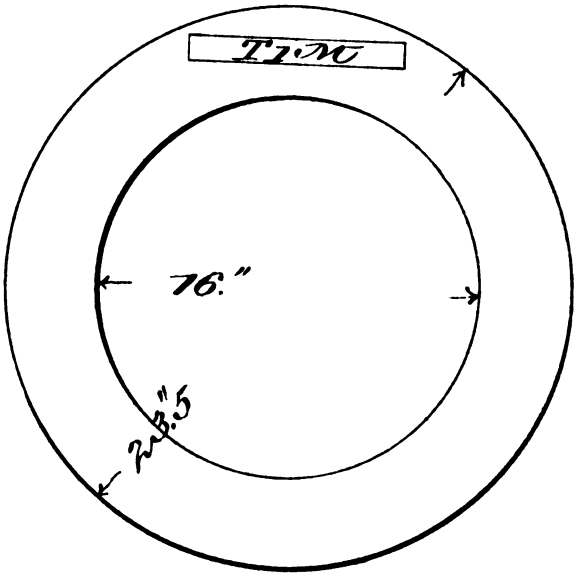
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000667	.000184	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.000983	.000150	0.	.....	
8,750	35,000	.001167	.000184	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
11,250	45,000	.001500	.000167	0.	.....	
12,500	50,000	.001700	.000200	0.	.....	
12,750	51,000	.001717	.000017	.....	.....	
13,000	52,000	.001750	.000033	.....	.....	
13,250	53,000	.001767	.000017	.....	.....	
13,500	54,000	.001800	.000033	.....	.....	
13,750	55,000	.001833	.000033	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001900	.000033	.....	.....	
14,500	58,000	.001917	.000017	.....	.....	
14,750	59,000	.001950	.000033	.....	.....	
15,000	60,000	.001983	.000033	.....	.....	
15,250	61,000	.002017	.000034	.....	.....	
15,500	62,000	.002050	.000033	.....	.....	
15,750	63,000	.002100	.000050	.....	.....	
16,000	64,000	.002150	.000050	.....	.....	Elastic limit.
16,250	65,000	.002733	.000583	.....	.....	
16,500	66,000	.003333	.000600	.....	.....	
17,000	68,000	.005083	.001750	.....	.....	
17,500	70,000	.009000	.003917	.....	.....	
18,000	72,000	.010333	.001333	.....	.....	
18,500	74,000	.011667	.001334	.....	.....	
19,000	76,000	.013350	.001683	.....	.....	
19,500	78,000	.015167	.001817	.....	.....	
20,000	80,000	.017500	.002333	.....	.....	
20,500	82,000	.019667	.002167	.....	.....	
21,000	84,000	.021333	.001666	.....	.....	
21,500	86,000	.023450	.002117	.....	.....	
22,000	88,000	.026167	.002717	.....	.....	
22,500	90,000	.028833	.002666	.....	.....	
23,000	92,000	.031500	.002667	.....	.....	
23,500	94,000	.034167	.002667	.....	.....	
24,000	96,000	.037500	.003333	.....	.....	
24,500	98,000	.042667	.005167	.....	.....	
25,000	100,000	.0467	.004033	.....	.....	
25,500	102,000	.0500	.0033	.....	.....	
26,000	104,000	.0567	.0067	.....	.....	
26,500	106,000	.0700	.0133	.....	.....	
26,700	106,800	.....	.....	.....	.....	Tensile strength.

General summary.

Specific gravity	7.8491
Hardness	21.89
Tensile strength per square inch of original section ..... pounds	106,800
Elastic limit per square inch of original section ..... do	64,000
Elongation per inch after rupture ..... inch	0.0767
Elongation per inch under strain at elastic limit ..... do	.002150
Reduction in diameter at point of rupture ..... do	.034
Reduction in area after rupture, per centum of original section	11.8
Position of rupture	".30 from neck
Character of broken surface	granular, with radial section of silky metal
Elongation of inch sections	".05, ".06, ".06, ".08, ".08, ".13*

10" Steel B. L. Rifle No.:

Hoop C 3



H Ex 31 49 2

No. 2646.

Marks, $^{10}\,{}^{R}_{T}\,{}^{C}_{M}$
Diameter, ″.564.
Sectional area, .25 square inch.

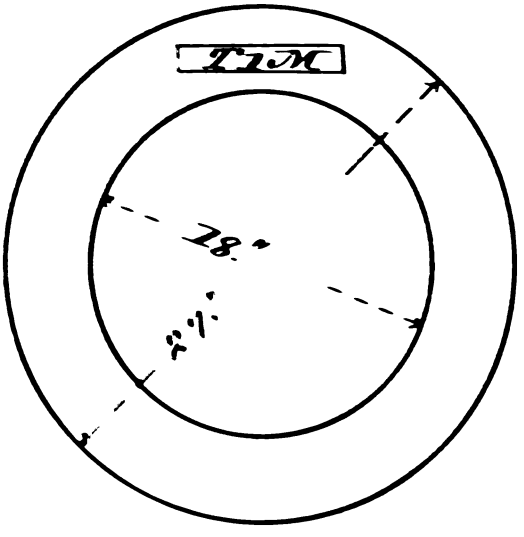
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000233	.000116	0.	.....	
3,750	15,000	.000450	.000217	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000800	.000167	.000017	.000017	
7,500	30,000	.000983	.000183	.000017	0.	
8,750	35,000	.001150	.000167	.000017	0.	
10,000	40,000	.001317	.000167	.000017	0.	
11,250	45,000	.001483	.000166	.000033	.000016	
12,500	50,000	.001650	.000167	.000033	0.	
12,750	51,000	.001683	.000033	.....	.....	
13,000	52,000	.001717	.000034	.....	.....	
13,250	53,000	.001733	.000016	.....	.....	
13,500	54,000	.001750	.000017	.....	.....	
13,750	55,000	.001783	.000033	.....	.....	
14,000	56,000	.001817	.000034	.....	.....	
14,250	57,000	.001850	.000033	.....	.....	
14,500	58,000	.001883	.000033	.....	.....	
14,750	59,000	.001933	.000050	.....	.....	
15,000	60,000	.001967	.000034	.....	.....	
15,500	62,000	.002033	.000066	.....	.....	Elastic limit.
15,750	63,000	.010183	.008150	.....	.....	
16,000	64,000	.011133	.000950	.....	.....	
16,500	66,000	.012833	.001700	.....	.....	
17,000	68,000	.014583	.001750	.....	.....	
17,500	70,000	.016333	.001750	.....	.....	
18,000	72,000	.018283	.001950	.....	.....	
18,500	74,000	.020200	.001917	.....	.....	
19,000	76,000	.022283	.002083	.....	.....	
19,500	78,000	.024683	.002400	.....	.....	
20,000	80,000	.026883	.002200	.....	.....	
20,500	82,000	.029667	.002784	.....	.....	
21,000	84,000	.032533	.002866	.....	.....	
21,500	86,000	.035500	.002967	.....	.....	
22,000	88,000	.039167	.003667	.....	.....	
22,500	90,000	.0417	.002533	.....	.....	
23,000	92,000	.0483	.0066	.....	.....	
23,500	94,000	.0533	.0050	.....	.....	
24,000	96,000	.0650	.0117	.....	.....	
24,500	98,000	.0767	.0117	.....	.....	
25,000	100,000	.1000	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,000
Elastic limit per square inch of original section	do...	62,000
Elongation per inch after rupture	inch..	0.1633
Elongation per inch under strain at elastic limit	do...	.002033
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		1″.08 from neck
Character of broken surface		silky
Elongation of inch sections		″.08, ″.10, ″.11, ″.13, ″.20, ″.26*

10" Steel B.L. Rifle No.

Hoop C 5



H Ex 31 492

No. 2208.

:s, ^{10} ^{R_1} ^{C_s} $_{T_1}$ $_{M}$

ıeter, ″.545.

ıonal area, .233 square inch.

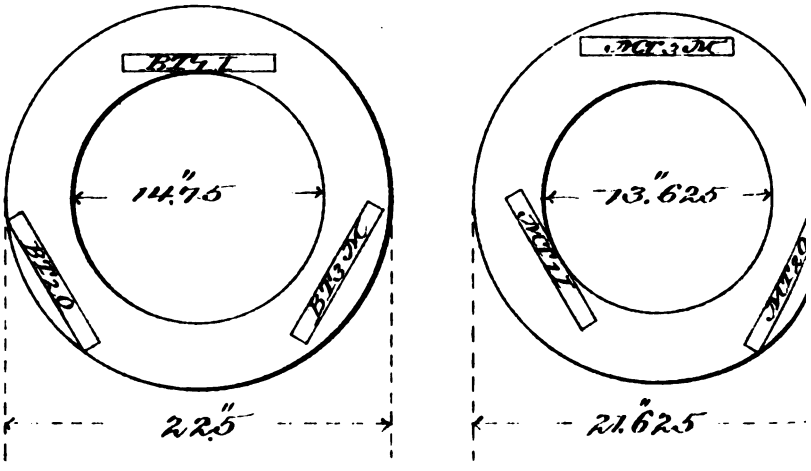
plied loads. L	Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
ıs.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
3	1,000	0.	0.	0.	0.	Initial load.
5	5,000	.000067	.000067	0.	.....	
0	10,000	.000217	.000150	0.	.....	
5	15,000	.000367	.000150	0.	.....	
0	20,000	.000550	.000183	0.	.....	
5	25,000	.000700	.000150	0.	.....	
0	30,000	.000883	.000183	0.	.....	
5	35,000	.001033	.000150	0.	.....	
0	40,000	.001200	.000167	0.	.....	
5	45,000	.001400	.000200	.000033	.000033	
8	46,000	.001450	.000050	.....	.....	
1	47,000	.001500	.000050	.....	.....	Elastic limit.
4	48,000	.001583	.000083	.....	.....	
7	49,000	.001683	.000100	.....	.....	
0	50,000	.001783	.000100	.000217	.000184	
3	51,000	.002067	.000284	.....	.....	
6	52,000	.002300	.000233	.....	.....	
9	53,000	.002983	.000683	.....	.....	
2	54,000	.003533	.000550	.....	.....	
5	55,000	.004400	.000867	.....	.....	
8	56,000	.005500	.001100	.....	.....	
1	57,000	.006833	.001333	.....	.....	
4	58,000	.007467	.000634	.....	.....	
7	59,000	.008467	.001000	.....	.....	
0	60,000	.009967	.001500	.....	.....	
5	62,000	.011867	.001900	.....	.....	
2	64,000	.013617	.001750	.....	.....	
3	66,000	.016200	.002583	.....	.....	
4	68,000	.018117	.001917	.....	.....	
0	70,000	.020633	.002516	.....	.....	
5	72,000	.023317	.002684	.....	.....	
2	74,000	.025917	.002600	.....	.....	
1	76,000	.029583	.003666	.....	.....	
	78,000	.033167	.003584	.....	.....	
	80,000	.0350	.001833	.....	.....	
	82,000	.0417	.0067	.....	.....	
	84,000	.0483	.0066	.....	.....	
	86,000	.0550	.0067	.....	.....	
	88,000	.0633	.0083	.....	.....	
	90,000	.0783	.0150	.....	.....	
	91,370	.1167	.0384	.....	.....	Tensile strength.

General summary.

ıvity		7.8546
		18.19
ength per square inch of original section	pounds..	91,370
it per square inch of original section	do...	47,000
per inch after rupture	inch..	0.1483
per inch under strain at elastic limit	do...	.001500
ın diameter at point of rupture	do...	.105
in area after rupture, per centum of original section		34.7
rupture		2″.9 from neck
of broken surface, granular; dull spot at circumference; opened a crack in the stem 1½ ɔm point of rupture.		
of inch sections		″.11, ″.15, ″.33*, ″.14, ″.09, ″.07

10" Steel B. L. Rifle No. 1

Hoop C5



H Ex 31 49 2

No. 2762.

ks, ^{10} R, C$_5$ / B T, I

neter, ″.564.

ional area, .25 square inch.

pplied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
il.	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50	1,000	0.	0.	0.	0.	Initial load.
50	5,000	.000150	.000150	0.	.....	
00	10,000	.000317	.000167	0.	.....	
50	15,000	.000500	.000183	0.	.....	
00	20,000	.000667	.000167	0.	.....	
50	25,000	.000833	.000166	0.	.....	
00	30,000	.001017	.000184	0.	.....	
50	35,000	.001183	.000166	0.	.....	
00	40,000	.001350	.000167	0.	.....	
50	45,000	.001500	.000150	.....	.....	
00	50,000	.001667	.000167	.....	.....	
50	51,000	.001717	.000050	.....	.....	
00	52,000	.001767	.000050	.....	.....	
50	53,000	.001783	.000016	.....	.....	
00	54,000	.001817	.000034	.....	.....	
50	55,000	.001850	.000033	.....	.....	
00	56,000	.001900	.000050	.....	.....	
50	57,000	.001933	.000033	.....	.....	
00	58,000	.001983	.000050	.....	.....	
50	59,000	.002000	.000017	.....	.....	
00	60,000	.002050	.000050	.....	.....	
0	61,000	.002083	.000033	.....	.....	
0	62,000	.002133	.000050	.....	.....	
0	63,000	.002167	.000034	.....	.....	
0	64,000	.002217	.000050	.....	.....	
0	65,000	.002267	.000050	.....	.....	
0	66,000	.002317	.000050	.....	.....	
0	67,000	.002383	.000066	.....	.....	Elastic limit.
0	68,000	.002483	.000100	.....	.....	
0	69,000	.002633	.000150	.....	.....	
0	70,000	.002917	.000284	.....	.....	
0	72,000	.003867	.000950	.....	.....	
0	74,000	.005417	.001550	.....	.....	
0	76,000	.007000	.001583	.....	.....	
0	78,000	.008417	.001417	.....	.....	
0	80,000	.009867	.001450	.....	.....	
0	82,000	.011333	.001466	.....	.....	
0	84,000	.012833	.001500	.....	.....	
0	86,000	.014583	.001750	.....	.....	
0	88,000	.016333	.001750	.....	.....	
0	90,000	.017750	.001317	.....	.....	
0	92,000	.019600	.001850	.....	.....	
0	94,000	.021333	.001733	.....	.....	
0	96,000	.023017	.001684	.....	.....	
0	98,000	.024917	.001900	.....	.....	
	100,000	.0267	.001783	.....	.....	
	102,000	.0300	.0033	.....	.....	
	104,000	.0333	.0033	.....	.....	
	106,000	.0350	.0017	.....	.....	
	108,000	.0383	.0033	.....	.....	
	110,000	.0433	.0050	.....	.....	
	112,000	.0483	.0050	.....	.....	
	114,000	.0533	.0050	.....	.....	
	116,000	.0650	.0117	.....	.....	
	118,000	.0767	.0117	.....	.....	
	118,880	.0950	.0183	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds..	118,880
it per square inch of original section	do...	67,000
per inch after rupture	inch..	0.1083
per inch under strain at elastic limit	do...	.002383
in diameter at point of rupture	do ..	.084
in area after rupture, per centum of original section		27.6
rupture		§ inch from neck
of broken surface	granular; radiating from a dull spot at circumference	
of inch sections		″.06, ″.07, ″.08, ″.09, ″.12, ″.23*

No. 2763.

Marks, $^{10}_{B}\,R_1\,C_5\,T_2\,O$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000450	.000150	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001450	.000167	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
13,750	55,000	.001833	.000200	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001917	.000050	.....	.....	
14,500	58,000	.001967	.000050	.....	.....	Elastic limit.
14,750	59,000	.002167	.000200	.....	.....	
15,000	60,000	.002417	.000250	.....	.....	
15,250	61,000	.002733	.000316	.....	.....	
15,500	62,000	.003183	.000450	.....	.....	
16,000	64,000	.004333	.001150	.....	.....	
16,500	66,000	.005833	.001500	.....	.....	
17,000	68,000	.007000	.001167	.....	.....	
17,500	70,000	.008417	.001417	.....	.....	
18,000	72,000	.009600	.001183	.....	.....	
18,500	74,000	.010917	.001317	.....	.....	
19,000	76,000	.012167	.001250	.....	.....	
19,500	78,000	.013533	.001366	.....	.....	
20,000	80,000	.015000	.001467	.....	.....	
20,500	82,000	.016533	.001533	.....	.....	
21,000	84,000	.018333	.001800	.....	.....	
21,500	86,000	.020000	.001667	.....	.....	
22,000	88,000	.021667	.001667	.....	.....	
22,500	90,000	.023500	.001833	.....	.....	
23,000	92,000	.025833	.002333	.....	.....	
23,500	94,000	.027917	.002084	.....	.....	
24,000	96,000	.030100	.002183	.....	.....	
24,500	98,000	.0333	.0032	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0433	.0033	.....	.....	
26,500	106,000	.0483	.0050	.....	.....	
27,000	108,000	.0533	.0050	.....	.....	
27,500	110,000	.0617	.0084	.....	.....	
28,000	112,000	.0767	.0150	.....	.....	
28,450	113,800	.1133	.0266	.....	.....	Tensile strengt

General summary.

Tensile strength per square inch of original section.....pound
Elastic limit per square inch of original section.....do
Elongation per inch after rupture.....incl
Elongation per inch under strain at elastic limit.....do
Reduction in diameter at point of rupture.....do
Reduction in area after rupture, per centum of original section.....
Position of rupture.....".05 from mi
Character of broken surface.....granular; radiating from a dull spot at cir
Elongation of inch sections.....".07, ".12, ".15*, ".

No. 2764.

Marks, $^{10}_{B}\,R_1\,C_2\,T_3\,M$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000950	.000183	0.	.....	
8,750	35,000	.001100	.000150	0.	.....	
10,000	40,000	.001267	.000167	0.	.....	
11,250	45,000	.001450	.000183	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001717	.000034	.....	.....	
13,500	54,000	.001750	.000033	.....	.....	
13,750	55,000	.001783	.000033	.....	.....	
14,000	56,000	.001850	.000067	.....	.....	
14,250	57,000	.001900	.000050	.....	.....	
14,500	58,000	.001967	.000067	.....	.....	
14,750	59,000	.002050	.000083	.....	.....	Elastic limit.
15,000	60,000	.002217	.000167	.....	.....	
15,250	61,000	.002500	.000283	.....	.....	
15,500	62,000	.002917	.000417	.....	.....	
16,000	64,000	.004217	.001300	.....	.....	
16,500	66,000	.005583	.001366	.....	.....	
17,000	68,000	.007167	.001584	.....	.....	
17,500	70,000	.008667	.001500	.....	.....	
18,000	72,000	.010333	.001666	.....	.....	
18,500	74,000	.011700	.001367	.....	.....	
19,000	76,000	.013117	.001417	.....	.....	
19,500	78,000	.014600	.001483	.....	.....	
20,000	80,000	.016417	.001817	.....	.....	
20,500	82,000	.017867	.001450	.....	.....	
21,000	84,000	.019667	.001800	.....	.....	
21,500	86,000	.021333	.001666	.....	.....	
22,000	88,000	.023300	.001967	.....	.....	
22,500	90,000	.025600	.002300	.....	.....	
23,000	92,000	.028000	.002400	.....	.....	
23,500	94,000	.030367	.002367	.....	.....	
24,000	96,000	.0333	.002933	.....	.....	
24,500	98,000	.0367	.0034	.....	.....	
25,000	100,000	.0400	.0033	.....	.....	
25,500	102,000	.0433	.0033	.....	.....	
26,000	104,000	.0483	.0050	.....	.....	
26,500	106,000	.0550	.0067	.....	.....	
27,000	108,000	.0667	.0117	.....	.....	
27,500	110,000	.0833	.0166	.....	.....	
27,700	110,080	.1017	.0184	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	110,800
Elastic limit per square inch of original section	do	59,000
Elongation per inch after rupture	inch	0.1333
Elongation per inch under strain at elastic limit	do	.002050
Reduction in diameter at point of rupture	do	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1″.50 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.07, ″.08, ″.10, ″.12, ″.29*, ″.1

No. 2765.

Marks, $\frac{10\ R_1\ C_s}{M\ T_1\ I}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remark
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000450	.000150	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000783	.000150	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001300	.000183	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001717	.000017	.....	.....	
13,500	54,000	.001767	.000050	.....	.....	
13,750	55,000	.001817	.000050	.....	.....	Elastic limit.
14,000	56,000	.001900	.000083	.....	.....	
14,250	57,000	.001983	.000083	.....	.....	
14,500	58,000	.002150	.000167	.....	.....	
14,750	59,000	.002333	.000183	.....	.....	
15,000	60,000	.002667	.000334	.....	.....	
15,500	62,000	.003633	.000966	.....	.....	
16,000	64,000	.004750	.001117	.....	.....	
16,500	66,000	.005950	.001200	.....	.....	
17,000	68,000	.007767	.001817	.....	.....	
17,500	70,000	.010000	.002233	.....	.....	
18,000	72,000	.011133	.001133	.....	.....	
18,500	74,000	.012250	.001117	.....	.....	
19,000	76,000	.013683	.001433	.....	.....	
19,500	78,000	.015667	.001984	.....	.....	
20,000	80,000	.017500	.001833	.....	.....	
20,500	82,000	.019500	.002000	.....	.....	
21,000	84,000	.021333	.001833	.....	.....	
21,500	86,000	.023333	.002000	.....	.....	
22,000	88,000	.025750	.002417	.....	.....	
22,500	90,000	.028083	.002333	.....	.....	
23,000	92,000	.030833	.002750	.....	.....	
23,500	94,000	.0333	.0024	.....	.....	
24,000	96,000	.0367	.0034	.....	.....	
24,500	98,000	.0417	.0050	.....	.....	
25,000	100,000	.0467	.0050	.....	.....	
25,500	102,000	.0517	.0050	.....	.....	
26,000	104,000	.0600	.0083	.....	.....	
26,500	106,000	.0717	.0117	.....	.....	Tensile strengt

General summary.

Tensile strength per square inch of original section.....pound
Elastic limit per square inch of original section.....do.
Elongation per inch after rupture.....inch
Elongation per inch under strain at elastic limit.....do.
Reduction in diameter at point of rupture.....do.
Reduction in area after rupture, per centum of original section .....
Position of rupture.....½ inch
Character of broken surface.....granular; radiating from a flaky spot near cir
Elongation of inch sections ..... ″.05, ″.07, ″.06, ″.0

No. 2766.

$10\,R_1\,C_2$
$M\,T_2\,O$
ter, ″.564.
nal area, .25 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000150	.000150	0.	.....	
10,000	.000317	.000167	0.	.....	
15,000	.000483	.000166	0.	.....	
20,000	.000633	.000150	0.	.....	
25,000	.000800	.000167	0.	.....	
30,000	.000983	.000183	0.	.....	
35,000	.001150	.000167	0.	.....	
40,000	.001317	.000167	0.	.....	
45,000	.001483	.000166	.....	.....	
50,000	.001650	.000167	.....	.....	
51,000	.001683	.000033	.....	.....	
52,000	.001717	.000034	.....	.....	
53,000	.001767	.000050	.....	.....	
54,000	.001800	.000033	.....	.....	
55,000	.001833	.000033	.....	.....	
56,000	.001867	.000034	.....	.....	
57,000	.001900	.000033	.....	.....	
58,000	.001933	.000033	.....	.....	
59,000	.001983	.000050	.....	.....	
60,000	.002033	.000050	.....	.....	Elastic limit.
61,000	.002117	.000084	.....	.....	
62,000	.002200	.000083	.....	.....	
63,000	.002300	.000100	.....	.....	
64,000	.002500	.000200	.....	.....	
65,000	.002717	.000217	.....	.....	
66,000	.003183	.000466	.....	.....	
68,000	.004167	.000984	.....	.....	
70,000	.005217	.001050	.....	.....	
72,000	.006500	.001283	.....	.....	
74,000	.007683	.001183	.....	.....	
76,000	.009017	.001334	.....	.....	
78,000	.010233	.001216	.....	.....	
80,000	.011583	.001350	.....	.....	
82,000	.013083	.001500	.....	.....	
84,000	.014383	.001300	.....	.....	
86,000	.015917	.001534	.....	.....	
88,000	.017500	.001583	.....	.....	
90,000	.019017	.001517	.....	.....	
92,000	.020767	.001750	.....	.....	
94,000	.022500	.001733	.....	.....	
96,000	.024333	.001833	.....	.....	
98,000	.026333	.002000	.....	.....	
100,000	.028500	.002167	.....	.....	
102,000	.0317	.0032	.....	.....	
104,000	.0350	.0033	.....	.....	
106,000	.0367	.0017	.....	.....	
108,000	.0417	.0050	.....	.....	
110,000	.0467	.0050	.....	.....	
112,000	.0517	.0050	.....	.....	
114,000	.0550	.0033	.....	.....	
116,000	.0667	.0117	.....	.....	
118,000	.0800	.0133	.....	.....	
118,480	.0983	.0183	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	118,480
per square inch of original section	do...	60,000
er inch after rupture	inch..	0.1150
er inch under strain at elastic limit	do...	.002033
diameter at point of rupture	do...	.084
area after rupture, per centum of original section		27.6
rupture	″.05 from middle of stem	
broken surface	granular; silky center	
f inch sections	″.07, ″.10, ″.23*, ″.15, ″.08, ″.06	

No. 2767.

Marks, $^{10\ R_1\ C_2}_{M\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

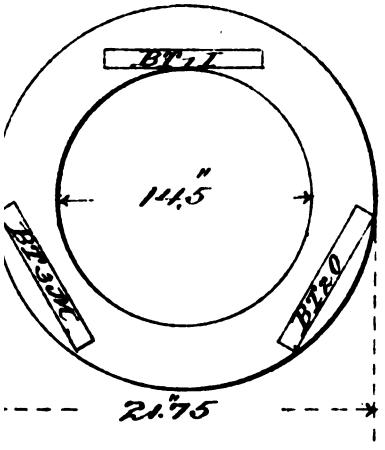
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarl
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000467	.000150	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000800	.000150	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001483	.000183	.....	.....	
12,500	50,000	.001683	.000200	.....	.....	
12,750	51,000	.001733	.000050	.....	.....	
13,000	52,000	.001800	.000067	.....	.....	Elastic limit.
13,250	53,000	.002200	.000400	.....	.....	
13,500	54,000	.002750	.000550	.....	.....	
13,750	55,000	.003217	.000467	.....	.....	
14,000	56,000	.003850	.000633	.....	.....	
14,250	57,000	.004500	.000650	.....	.....	
14,500	58,000	.005183	.000683	.....	.....	
14,750	59,000	.005700	.000517	.....	.....	
15,000	60,000	.006300	.000600	.....	.....	
15,500	62,000	.007433	.001133	.....	.....	
16,000	64,000	.008717	.001284	.....	.....	
16,500	66,000	.010167	.001450	.....	.....	
17,000	68,000	.011417	.001250	.....	.....	
17,500	70,000	.013000	.001583	.....	.....	
18,000	72,000	.014750	.001750	.....	.....	
18,500	74,000	.016267	.001517	.....	.....	
19,000	76,000	.017750	.001483	.....	.....	
19,500	78,000	.019500	.001750	.....	.....	
20,000	80,000	.021167	.001667	.....	.....	
20,500	82,000	.022917	.001750	.....	.....	
21,000	84,000	.024917	.002000	.....	.....	
21,500	86,000	.027333	.002416	.....	.....	
22,000	88,000	.029583	.002250	.....	.....	
22,500	90,000	.0333	.003717	.....	.....	
23,000	92,000	.0367	.0034	.....	.....	
23,500	94,000	.0383	.0016	.....	.....	
24,000	96,000	.0433	.0050	.....	.....	
24,500	98,000	.0467	.0034	.....	.....	
25,000	100,000	.0533	.0066	.....	.....	
25,500	102,000	.0617	.0084	.....	.....	
26,000	104,000	.0700	.0083	.....	.....	
26,500	106,000	.0883	.0183	.....	.....	
26,640	106,560	.1117	.0234	.....	.....	Tensile streng

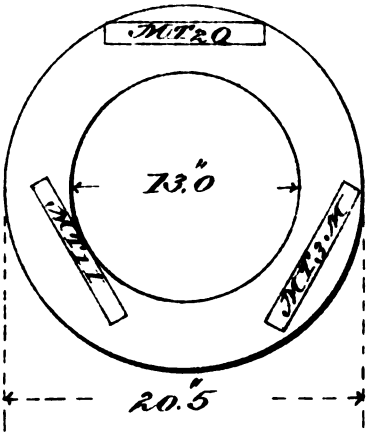
General summary.

Tensile strength per square inch of original section.....poun
Elastic limit per square inch of original section .....d
Elongation per inch after rupture.....in
Elongation per inch under strain at elastic limit .....d
Reduction in diameter at point of rupture.....d
Reduction in area after rupture, per centum of original section .....
Position of rupture .....1".
Character of broken surface.....granular;
Elongation of inch sections.....".08, ".28*, ".12, "

10" Steel B.L. Rifle No. 1

Hoop C 6





H Ex 3/ 49 2

No. 2750.

18, ^{10} R, C
B T, I
ıeter, ".564.
ional area, .25 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
L.	Per square inch.					
ls.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
)	1,000	0.	0.	0.	0.	Initial load.
)	5,000	.000150	.000150	0.	.....	
)	10,000	.000317	.000167	0.	.....	
)	15,000	.000483	.000166	0.	.....	
)	20,000	.000650	.000167	0.	.....	
)	25,000	.000800	.000150	0.	.....	
)	30,000	.000983	.000183	0.	.....	
)	35,000	.001150	.000167	0.	.....	
)	40,000	.001333	.000183	.000017	.000017	
)	45,000	.001500	.000167	.....	.....	
)	50,000	.001667	.000167	.....	.....	
)	51,000	.001683	.000016	.....	.....	
)	52,000	.001717	.000034	.....	.....	
)	53,000	.001767	.000050	.....	.....	
)	54,000	.001817	.000050	.....	.....	
)	55,000	.001850	.000033	.....	.....	
)	56,000	.001883	.000033	.....	.....	
)	57,000	.001917	.000034	.....	.....	
)	58,000	.001967	.000050	.....	.....	
)	59,000	.002000	.000033	.....	.....	
)	60,000	.002117	.000117	.....	.....	
)	61,000	.002167	.000050	.....	.....	Elastic limit.
)	62,000	.002317	.000150	.....	.....	
)	63,000	.002433	.000116	.....	.....	
)	64,000	.002667	.000234	.....	.....	
)	65,000	.002917	.000250	.....	.....	
)	66,000	.003300	.000383	.....	.....	
)	68,000	.004183	.000883	.....	.....	
)	70,000	.005333	.001150	.....	.....	
)	72,000	.006667	.001334	.....	.....	
)	74,000	.008333	.001666	.....	.....	
)	76,000	.010000	.001667	.....	.....	
)	78,000	.011667	.001667	.....	.....	
)	80,000	.013333	.001666	.....	.....	
)	82,000	.015117	.001784	.....	.....	
)	84,000	.016833	.001716	.....	.....	
)	86,000	.018833	.002000	.....	.....	
)	88,000	.020833	.002000	.....	.....	
)	90,000	.022500	.001667	.....	.....	
)	92,000	.024833	.002333	.....	.....	
)	94,000	.027333	.002500	.....	.....	
)	96,000	.030000	.002667	.....	.....	
	98,000	.0317	.0017	.....	.....	
	100,000	.0350	.0033	.....	.....	
	102,000	.0383	.0033	.....	.....	
	104,000	.0450	.0067	.....	.....	
	106,000	.0500	.0050	.....	.....	
	108,000	.0567	.0067	.....	.....	
	110,000	.0683	.0016	.....	.....	
	111,640	.0983	.0300	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	111,640
t per square inch of original section	....do...	61,000
per inch after rupture	inch..	0.1167
per inch under strain at elastic limit	do...	.002167
diameter at point of rupture	do...	.104
area after rupture, per centum of original section		33.5
upture		¾ inch from neck
broken surface		granular; silky spot in center
f inch sections		".26*, ".09, ".07, ".08, ".09, ".11

No. 2751.

Marks, $^{10\ R_1\ C_6}_{B\ T_2\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000950	.000183	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001433	.000150	.....	.....	
12,500	50,000	.001633	.000200	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001733	.000050	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	
13,750	55,000	.001833	.000050	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	Elastic limit.
14,250	57,000	.002017	.000150	.....	.....	
14,500	58,000	.002300	.000283	.....	.....	
14,750	59,000	.002517	.000217	.....	.....	
15,000	60,000	.002833	.000316	.....	.....	
15,500	62,000	.004000	.001167	.....	.....	
16,000	64,000	.005333	.001333	.....	.....	
16,500	66,000	.006583	.001250	.....	.....	
17,000	68,000	.007800	.001217	.....	.....	
17,500	70,000	.009167	.001367	.....	.....	
18,000	72,000	.010917	.001750	.....	.....	
18,500	74,000	.011950	.001033	.....	.....	
19,000	76,000	.013533	.001583	.....	.....	
19,500	78,000	.015117	.001584	.....	.....	
20,000	80,000	.016700	.001583	.....	.....	
20,500	82,000	.018333	.001633	.....	.....	
21,000	84,000	.020050	.001717	.....	.....	
21,500	86,000	.021867	.001817	.....	.....	
22,000	88,000	.024000	.002133	.....	.....	
22,500	90,000	.026333	.002333	.....	.....	
23,000	92,000	.028333	.002000	.....	.....	
23,500	94,000	.030833	.002500	.....	.....	
24,000	96,000	0333	.002467	.....	.....	
24,500	98,000	.0367	.0034	.....	.....	
25,000	100,000	.0417	.0050	.....	.....	
25,500	102,000	.0450	.0033	.....	.....	
26,000	104,000	.0517	.0067	.....	.....	
26,500	106,000	.0567	.0050	.....	.....	
27,000	108,000	.0683	.0116	.....	.....	
27,500	110,000	.0967	.0284	.....	.....	
27,520	110,080	.1000	.0033	.....	.....	Tensile strengt

General summary.

Tensile strength per square inch of original section.....pound
Elastic limit per square inch of original section.....d
Elongation per inch after rupture.....inc
Elongation per inch under strain at elastic limit.....d
Reduction in diameter at point of rupture.....d
Reduction in area after rupture, per centum of original section.....
Position of rupture.....1″.
Character of broken surface.....granular;
Elongation of inch sections.....″.06, ″.08, ″.10, ″.

No. 2652.

Marks, $\frac{10\ R_1\ C_6}{B\ T_3\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000467	.000184	0.	.....	
5,000	20,000	.000617	.000150	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001133	.000183	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	
13,750	55,000	.001833	.000050	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001933	.000066	.....	.....	Elastic limit.
14,500	58,000	.002117	.000184	.....	.....	
14,750	59,000	.002250	.000133	.....	.....	
15,000	60,000	.002583	.000333	.....	.....	
15,500	62,000	.003550	.000967	.....	.....	
16,000	64,000	.005117	.001567	.....	.....	
16,500	66,000	.006350	.001233	.....	.....	
17,000	68,000	.007750	.001400	.....	.....	
17,500	70,000	.009167	.001417	.....	.....	
18,000	72,000	.010667	.001500	.....	.....	
18,500	74,000	.011950	.001283	.....	.....	
19,000	76,000	.013417	.001467	.....	.....	
19,500	78,000	.014917	.001500	.....	.....	
20,000	80,000	.016500	.001583	.....	.....	
20,500	82,000	.018183	.001683	.....	.....	
21,000	84,000	.019917	.001734	.....	.....	
21,500	86,000	.021867	.001950	.....	.....	
22,000	88,000	.024167	.002300	.....	.....	
22,500	90,000	.026083	.001916	.....	.....	
23,000	92,000	.028250	.002167	.....	.....	
23,500	94,000	.030583	.002333	.....	.....	
24,000	96,000	.0333	.002717	.....	.....	
24,500	98,000	.0367	.0034	.....	.....	
25,000	100,000	.0400	.0033	.....	.....	
25,500	102,000	.0467	.0067	.....	.....	
26,000	104,000	.0517	.0050	.....	.....	
26,500	106,000	.0567	.0050	.....	.....	
27,000	108,000	.0667	.0100	.....	.....	
27,500	110,000	.0850	.0183	.....	.....	
27,620	110,520	.1067	.0217	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	110,520
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.1467
Elongation per inch under strain at elastic limit	do...	.001933
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		32.5
Position of rupture		3 inches from neck
Character of broken surface		granular; silky center
Elongation of inch sections		".10, ".16, ".29*, ".15, ".10, ".08

No. 2753.

Marks, $^{10}_{M}\,R_1\,C_4\,T_1\,I$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remark
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0..	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000500	.000167	0.	.....	
5,000	20,000	.000650	.000150	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001183	.000200	0.	.....	
10,000	40,000	.001367	.000184	0.	.....	
11,250	45,000	.001533	.000166	.....	.....	
12,500	50,000	.001717	.000184	.....	.....	
12,750	51,000	.001767	.000050	.....	.....	
13,000	52,000	.001817	.000050	.....	.....	Elastic limit.
13,250	53,000	.001967	.000150	.....	.....	
13,500	54,000	.002250	.000283	.....	.....	
13,750	55,000	.002500	.000250	.....	.....	
14,000	56,000	.003167	.000667	.....	.....	
14,250	57,000	.003667	.000500	.....	.....	
14,500	58,000	.004167	.000500	.....	.....	
14,750	59,000	.004667	.000500	.....	.....	
15,000	60,000	.005283	.000616	.....	.....	
15,500	62,000	.006500	.001217	.....	.....	
16,000	64,000	.007800	.001300	.....	.....	
16,500	66,000	.009083	.001283	.....	.....	
17,000	68,000	.010333	.001250	.....	.....	
17,500	70,000	.011667	.001334	.....	.....	
18,000	72,000	.013100	.001433	.....	.....	
18,500	74,000	.014583	.001483	.....	.....	
19,000	76,000	.016083	.001500	.....	.....	
19,500	78,000	.017567	.001484	.....	.....	
20,000	80,000	.019167	.001600	.....	.....	
20,500	82,000	.020917	.001750	.....	.....	
21,000	84,000	.022917	.002000	.....	.....	
21,500	86,000	.024833	.001916	.....	.....	
22,000	88,000	.027000	.002167	.....	.....	
22,500	90,000	.029333	.002333	.....	.....	
23,000	92,000	.0317	.002367	.....	.....	
23,500	94,000	.0350	.0033	.....	.....	
24,000	96,000	.0383	.0033	.....	.....	
24,500	98,000	.0417	.0034	.....	.....	
25,000	100,000	.0467	.0050	.....	.....	
25,500	102,000	.0517	.0050	.....	.....	
26,000	104,000	.0583	.0066	.....	.....	
26,500	106,000	.0683	.0100	.....	.....	
27,000	108,000	.0883	.0200	.....	.....	
27,050	108,200	.1017	.0134	.....	.....	Tensile streng

General summary.

Tensile strength per square inch of original section.....poun
Elastic limit per square inch of original section.....d
Elongation per inch after rupture.....inc
Elongation per inch under strain at elastic limit.....d
Reduction in diameter at point of rupture.....d
Reduction in area after rupture, per centum of original section.....
Position of rupture.....3¼ inch
Character of broken surface.....granular;
Elongation of inch sections.....".09, ".11, ".20*, "

No. 2754.

18, 10 T, C, M T, O
ieter, ".564.
onal area, .25 square inch.

plied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000117	.000117	0.	.....	
10,000	.000283	.000166	0.	.....	
15,000	.000450	.000167	0.	.....	
20,000	.000633	.000183	0.	.....	
25,000	.000800	.000167	0.	.....	
30,000	.000983	.000183	0.	.....	
35,000	.001150	.000167	0.	.....	
40,000	.001317	.000167	0.	.....	
45,000	.001483	.000166	.....	.....	
50,000	.001650	.000167	.....	.....	
51,000	.001717	.000067	.....	.....	
52,000	.001783	.000066	.....	.....	
53,000	.001817	.000034	.....	.....	Elastic limit.
54,000	.001917	.000100	.....	.....	
55,000	.002017	.000100	.....	.....	
56,000	.002133	.000116	.....	.....	
57,000	.002600	.000467	.....	.....	
58,000	.003033	.000433	.....	.....	
59,000	.003367	.000333	.....	.....	
60,000	.003917	.000550	.....	.....	
62,000	.005133	.001216	.....	.....	
64,000	.006333	.001200	.....	.....	
66,000	.007567	.001234	.....	.....	
68,000	.008783	.001216	.....	.....	
70,000	.010083	.001300	.....	.....	
72,000	.011500	.001417	.....	.....	
74,000	.012833	.001333	.....	.....	
76,000	.014167	.001334	.....	.....	
78,000	.015667	.001500	.....	.....	
80,000	.017167	.001500	.....	.....	
82,000	.018667	.001500	.....	.....	
84,000	.020433	.001766	.....	.....	
86,000	.022133	.001700	.....	.....	
88,000	.023833	.001700	.....	.....	
90,000	.025833	.002000	.....	.....	
92,000	.028267	.002434	.....	.....	
94,000	.030833	.002566	.....	.....	
96,000	.0333	.002467	.....	.....	
98,000	.0367	.0034	.....	.....	
100,000	.0383	.0016	.....	.....	
102,000	.0450	.0067	.....	.....	
104,000	.0500	.0050	.....	.....	
106,000	.0550	.0050	.....	.....	
108,000	.0650	.0100	.....	.....	
110,000	.0833	.0183	.....	.....	
110,720	.1017	.0184	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds..	110,720
it per square inch of original section	do...	53,000
per inch after rupture	inch..	0.1283
per inch under strain at elastic limit	do...	.001817
in diameter at point of rupture	do...	.094
in area after rupture, per centum of original section		30.6
rupture		2".65 from neck
of broken surface		granular; silky center
of inch sections		".09, ".14, ".27*, ".13, ".08, ".06

No. 2755.

Marks, $\frac{10\ R_1\ C_6}{M\ T_3\ M}$
Diameter ".564.
Sectional area, .25 square inch.

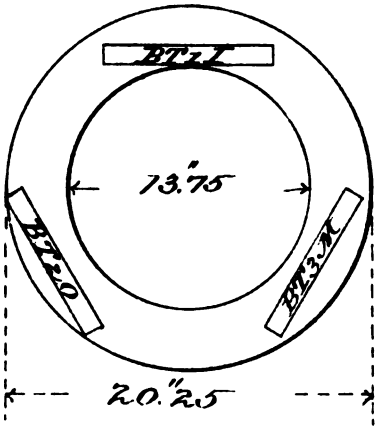
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Rem
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001683	.000116	.....	.....	
12,750	51,000	.001717	.000034	.....	.....	Elastic lim
13,000	52,000	.001833	.000116	.....	.....	
13,250	53,000	.001950	.000117	.....	.....	
13,500	54,000	.002233	.000283	.....	.....	
13,750	55,000	.002517	.000284	.....	.....	
14,000	56,000	.002850	.000333	.....	.....	
14,250	57,000	.003333	.000483	.....	.....	
14,500	58,000	.003917	.000584	.....	.....	
14,750	59,000	.004467	.000550	.....	.....	
15,000	60,000	.005050	.000583	.....	.....	
15,500	62,000	.006217	.001167	.....	.....	
16,000	64,000	.007450	.001233	.....	.....	
16,500	66,000	.008750	.001300	.....	.....	
17,000	68,000	.010083	.001333	.....	.....	
17,500	70,000	.011333	.001250	.....	.....	
18,000	72,000	.012583	.001250	.....	.....	
18,500	74,000	.014083	.001500	.....	.....	
19,000	76,000	.015667	.001584	.....	.....	
19,500	78,000	.017083	.00141[illegible]	.....	.....	
20,000	80,000	.018750	.00166[illegible]	.....	.....	
20,500	82,000	.020400	.001650	.....	.....	
21,000	84,000	.022050	.001650	.....	.....	
21,500	86,000	.023950	.001900	.....	.....	
22,000	88,000	.026083	.002133	.....	.....	
22,500	90,000	.028333	.002250	.....	.....	
23,000	92,000	.0317	.003367	.....	.....	
23,500	94,000	.0350	.0033	.....	.....	
24,000	96,000	.0367	.0017	.....	.....	
24,500	98,000	.0383	.0016	.....	.....	
25,000	100,000	.0450	.0067	.....	.....	
25,500	102,000	.0500	.0050	.....	.....	
26,000	104,000	.0550	.0050	.....	.....	
26,500	106,000	.0650	.0100	.....	.....	
27,000	108,000	.0783	.0133	.....	.....	
27,310	109,240	.1000	.0217	.....	.....	Tensile str

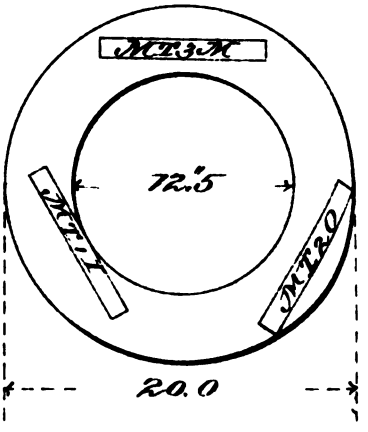
General summary.

Tensile strength per square inch of original section.....p
Elastic limit per square inch of original section.....
Elongation per inch after rupture.....
Elongation per inch under strain at elastic limit.....
Reduction in diameter at point of rupture.....
Reduction in area after rupture, per centum of original section.....
Position of rupture.....a
Character of broken surface.....granul
Elongation of inch sections.....".07, ".09, ".2

10" Steel B. L. Rifle No. 1

Hoop C7





H Ex 31 49 2

No. 2756.

ks, ^{10} R, C$_7$ B T, I
neter, ″.564.
ional area, .25 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
d.	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000117	.000117	0.	.....	
0	10,000	.000283	.000166	0.	.....	
0	15,000	.000450	.000167	0.	.....	
0	20,000	.000600	.000150	0.	.....	
0	25,000	.000767	.000167	0.	.....	
0	30,000	.000950	.000183	0.	.....	
0	35,000	.001133	.000183	0.	.....	
0	40,000	.001300	.000167	0.	.....	
0	45,000	.001467	.000167	.....	.....	
0	50,000	.001633	.000166	.....	.....	
0	51,000	.001667	.000034	.....	.....	
0	52,000	.001683	.000016	.....	.....	
0	53,000	.001717	.000034	.....	.....	
0	54,000	.001783	.000066	.....	.....	
0	55,000	.001817	.000034	.....	.....	
0	56,000	.001867	.000050	.....	.....	
0	57,000	.001900	.000033	.....	.....	Elastic limit.
0	58,000	.002000	.000100	.....	.....	
0	59,000	.002083	.000083	.....	.....	
0	60,000	.002217	.000134	.....	.....	
0	62,000	.002633	.000416	.....	.....	
0	64,000	.003417	.000784	.....	.....	
0	66,000	.004750	.001333	.....	.....	
0	68,000	.006083	.001333	.....	.....	
0	70,000	.007583	.001500	.....	.....	
0	72,000	.009083	.001500	.....	.....	
0	74,000	.010367	.001284	.....	.....	
0	76,000	.011867	.001500	.....	.....	
0	78,000	.013650	.001783	.....	.....	
0	80,000	.015167	.001517	.....	.....	
0	82,000	.016667	.001500	.....	.....	
0	84,000	.018183	.001516	.....	.....	
0	86,000	.020167	.001984	.....	.....	
0	88,000	.022167	.002000	.....	.....	
0	90,000	.024100	.001933	.....	.....	
0	92,000	.026217	.002117	.....	.....	
0	94,000	.0283	.002083	.....	.....	
0	96,000	.0317	.0034	.....	.....	
0	98,000	.0350	.0033	.....	.....	
0	100,000	.0383	.0033	.....	.....	
0	102,000	.0417	.0034	.....	.....	
0	104,000	.0467	.0050	.....	.....	
0	106,000	.0517	.0050	.....	.....	
0	108,000	.0600	.0083	.....	.....	
0	110,000	.0717	.0117	.....	.....	
0	111,160	.0917	.0200	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds..	111,160
it per square inch of original section	do...	57,000
per inch after rupture	inch..	0.0950
per inch under strain at elastic limit	do...	.001900
in diameter at point of rupture	do...	.054
in area after rupture, per centum of original section		18.3
rupture		″.70 from neck
of broken surface	granular; radiating from a dull spot at circumference	
of inch sections		″.18, ″.09, ″.08, ″.07, ″.07, ″.08

No. 2757.

Marks, $^{10\,R,\,C,}_{B\,T\,O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001450	.000167	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	Elastic limit.
14,000	56,000	.001933	.000116	.....	.....	
14,250	57,000	.002000	.000067	.....	.....	
14,500	58,000	.002117	.000117	.....	.....	
14,750	59,000	.002250	.000133	.....	.....	
15,000	60,000	.002667	.000417	.....	.....	
15,500	62,000	.003350	.000683	.....	.....	
16,000	64,000	.004350	.001000	.....	.....	
16,500	66,000	.005533	.001183	.....	.....	
17,000	68,000	.006917	.001384	.....	.....	
17,500	70,000	.008167	.001250	.....	.....	
18,000	72,000	.009583	.001416	.....	.....	
18,500	74,000	.011000	.001417	.....	.....	
19,000	76,000	.012000	.001000	.....	.....	
19,500	78,000	.013917	.001917	.....	.....	
20,000	80,000	.015083	.001166	.....	.....	
20,500	82,000	.016833	.001750	.....	.....	
21,000	84,000	.018417	.001584	.....	.....	
21,500	86,000	.020250	.001833	.....	.....	
22,000	88,000	.022083	.001833	.....	.....	
22,500	90,000	.024167	.002084	.....	.....	
23,000	92,000	.025967	.001800	.....	.....	
23,500	94,000	.0283	.002333	.....	.....	
24,000	96,000	.0317	.0034	.....	.....	
24,500	98,000	.0333	.0016	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0450	.0050	.....	.....	
26,500	106,000	.0500	.0050	.....	.....	
27,000	108,000	.0550	.0050	.....	.....	
27,500	110,000	.0650	.0100	.....	.....	
28,000	112,000	.0850	.0200	.....	.....	
28,120	112,480	.1033	.0183	.....	.....	Tensile strength

General summary.

Tensile strength per square inch of original section ..... pounds
Elastic limit per square inch of original section ..... do.
Elongation per inch after rupture ..... inch
Elongation per inch under strain at elastic limit ..... do.
Reduction in diameter at point of rupture ..... do.
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... at midc
Character of broken surface ..... granular; si
Elongation of inch sections ..... ".08, ".11, ".19*, ".21

No. 2758.

8, $^{10}R_1 C_7$ $B T_3 M$

eter, ″.564.

onal area, .25 square inch.

lied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
	Per square inch.					
t.	*Pounds.*	*Inch*	*Inch.*	*Inch.*	*Inch.*	
)	1,000	0.	0.	0.	0.	Initial load.
)	5,000	.000150	.000150	0.	.....	
)	10,000	.000317	.000167	0.	.....	
)	15,000	.000467	.000150	0.	.....	
)	20,000	.000633	.000166	0.	.....	
)	25,000	.000800	.000167	0.	.....	
)	30,000	.000967	.000167	0.	.....	
)	35,000	.001133	.000166	0.	.....	
)	40,000	.001300	.000167	0.	.....	
)	45,000	.001467	.000167	.....	.....	
)	50,000	.001667	.000200	.....	.....	
)	51,000	.001717	.000050	.....	.....	
)	52,000	.001750	.000033	.....	.....	
)	53,000	.001783	.000033	.....	.....	
)	54,000	.001800	.000017	.....	.....	
)	55,000	.001850	.000050	.....	.....	
)	56,000	.001933	.000083	.....	.....	
)	57,000	.001983	.000050	.....	.....	Elastic limit.
)	58,000	.002100	.000117	.....	.....	
)	59,000	.002250	.000150	.....	.....	
)	60,000	.002450	.000200	.....	.....	
)	62,000	.003067	.000617	.....	.....	
)	64,000	.004000	.000933	.....	.....	
)	66,000	.005167	.001167	.....	.....	
)	68,000	.006583	.001416	.....	.....	
)	70,000	.007833	.001250	.....	.....	
)	72,000	.009333	.001500	.....	.....	
)	74,000	.010617	.001284	.....	.....	
)	76,000	.012083	.001466	.....	.....	
)	78,000	.013533	.001450	.....	.....	
)	80,000	.014850	.001317	.....	.....	
)	82,000	.016500	.001650	.....	.....	
)	84,000	.018167	.001667	.....	.....	
)	86,000	.020000	.001833	.....	.....	
)	88,000	.022083	.002083	.....	.....	
)	90,000	.023833	.001750	.....	.....	
)	92,000	.026167	.002334	.....	.....	
)	94,000	.028333	.002166	.....	.....	
)	96,000	.030833	.002500	.....	.....	
)	98,000	.033750	.002917	.....	.....	
)	100,000	.0367	.002950	.....	.....	
)	102,000	.0400	.0033	.....	.....	
)	104,000	.0450	.0050	.....	.....	
)	106,000	.0500	.0050	.....	.....	
)	108,000	.0567	.0067	.....	.....	
)	110,000	.0667	.0100	.....	.....	
)	112,000	.0833	.0166	.....	.....	
)	112,120	.0950	.0117	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	112,120
mit per square inch of original section	do...	57,000
on per inch after rupture	inch..	0.0967
on per inch under strain at elastic limit	do...	.001983
n in diameter at point of rupture	do...	.074
n in area after rupture, per centum of original section		24.6
of rupture		½ inch from neck
r of broken surface		granular; dull spot at circumference
on of inch sections		″.07, ″.07, ″.07, ″.08, ″.10, ″.19*

No. 2759.

Marks, $^{10\,R_1\,C_7}_{M\,T_1\,I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000267	.000150	0.	.....	
3,750	15,000	.000450	.000183	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000767	.000150	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001117	.000184	0.	.....	
10,000	40,000	.001300	.000183	0.	.....	
11,250	45,000	.001450	.000150	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001767	.000034	.....	.....	
13,750	55,000	.001817	.000050	.....	.....	Elastic limit.
14,000	56,000	.001900	.000083	.....	.....	
14,250	57,000	.001983	.000083	.....	.....	
15,500	58,000	.002100	.000117	.....	.....	
14,750	59,000	.002217	.000117	.....	.....	
15,000	60,000	.002467	.000250	.....	.....	
15,500	62,000	.003000	.000533	.....	.....	
16,000	64,000	.003833	.000833	.....	.....	
16,500	66,000	.004917	.001084	.....	.....	
17,000	68,000	.006167	.001250	.....	.....	
17,500	70,000	.007533	.001366	.....	.....	
18,000	72,000	.009000	.001467	.....	.....	
18,500	74,000	.010283	.001283	.....	.....	
19,000	76,000	.011750	.001467	.....	.....	
19,500	78,000	.013167	.001417	.....	.....	
20,000	80,000	.014750	.001583	.....	.....	
20,500	82,000	.016500	.001750	.....	.....	
21,000	84,000	.018000	.001500	.....	.....	
21,500	86,000	.019700	.001700	.....	.....	
22,000	88,000	.021667	.001967	.....	.....	
22,500	90,000	.023667	.002000	.....	.....	
23,000	92,000	.025833	.002166	.....	.....	
23,500	94,000	.027833	.002000	.....	.....	
24,000	96,000	.030167	.002334	.....	.....	
24,500	98,000	.0333	.003133	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0450	.0050	.....	.....	
26,500	106,000	.0500	.0050	.....	.....	
27,000	108,000	.0550	.0050	.....	.....	
27,500	110,000	.0650	.0100	.....	.....	
27,800	111,200	.0900	.0250	.....	.....	Tensile strength

General summary.

Tensile strength per square inch of original section ..... pounds
Elastic limit per square inch of original section ..... do.
Elongation per inch after rupture ..... inch
Elongation per inch under strain at elastic limit ..... do
Reduction in diameter at point of rupture ..... do.
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ".45
Character of broken surface ..... granular; si
Elongation of inch sections ..... ".05, ".05 ".06 ".06

No. 2760.

·ks, ^{10} R, C, M T, O
meter, ″.564.
tional area, .25 square inch.

pplied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
ıl.	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50	1,000	0.	0.	0.	0.	Initial load.
50	5,000	.000117	.000117	0.	.....	
00	10,000	.000283	.000166	0.	.....	
50	15,000	.000450	.000167	0.	.....	
00	20,000	.000600	.000150	0.	.....	
50	25,000	.000767	.000167	0.	.....	
00	30,000	.000933	.000166	0.	.....	
50	35,000	.001117	.000184	0.	.....	
00	40,000	.001283	.000166	0.	.....	
50	45,000	.001450	.000167	.....	.....	
00	50,000	.001633	.000183	.....	.....	
50	51,000	.001683	.000050	.....	.....	Elastic limit.
00	52,000	.001783	.000100	.....	.....	
0	53,000	.001950	.000167	.....	.....	
00	54,000	.002467	.000517	.....	.....	
0	55,000	.002800	.000333	.....	.....	
0	56,000	.003367	.000567	.....	.....	
0	57,000	.003883	.000516	.....	.....	
0	58,000	.004500	.000617	.....	.....	
0	59,000	.005067	.000567	.....	.....	
0	60,000	.005833	.000766	.....	.....	
0	62,000	.006950	.001117	.....	.....	
0	64,000	.008333	.001383	.....	.....	
0	66,000	.009583	.001250	.....	.....	
0	68,000	.010917	.001334	.....	.....	
0	70,000	.012667	.001750	.....	.....	
0	72,000	.014167	.001500	.....	.....	
0	74,000	.015583	.001416	.....	.....	
0	76,000	.017100	.001517	.....	.....	
0	78,000	.018750	.001650	.....	.....	
0	80,000	.020783	.002033	.....	.....	
0	82,000	.022667	.001884	.....	.....	
0	84,000	.024833	.002166	.....	.....	
0	86,000	.026833	.002000	.....	.....	
0	88,000	.0300	.003167	.....	.....	
00	90,000	.0317	.0017	.....	.....	
00	92,000	.0350	.0033	.....	.....	
00	94,000	.0383	.0033	.....	.....	
00	96,000	.0417	.0034	.....	.....	
00	98,000	.0467	.0050	.....	.....	
00	100,000	.0517	.0050	.....	.....	
00	102,000	.0567	.0050	.....	.....	
00	104,000	.0683	.0116	.....	.....	
00	106,000	.0833	.0150	.....	.....	
00	107,440	.1167	.0334	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	107,440
mit per square inch of original section	do...	51,000
n per inch after rupture	inch..	0.1417
n per inch under strain at elastic limit	do...	.001683
n in diameter at point of rupture	do...	.084
n in area after rupture, per centum of original section		27.6
of rupture	2¼ inches from neck	
of broken surface	granular; silky spot near center	
n of inch sections	.09, ″.22*, ″.23*, ″.15, ″.10, ″.06	

No. 2761.

Marks, $^{10\,R_1\,C_7}_{M\,T_2\,M}$
Diameter, ".564.
Sectional area, .25 square inch.

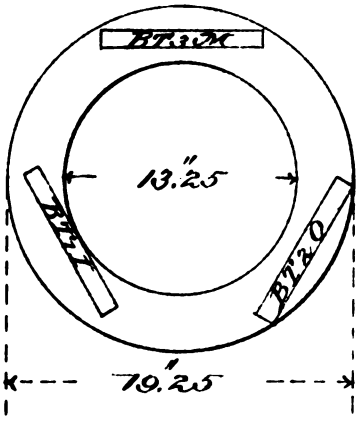
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001150	.000167	0.	.....	
10,000	40,000	.001317	.000167	.000017	.000017	
11,250	45,000	.001483	.000166	.....	.....	
12,500	50,000	.001667	.000184	.....	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001750	.000050	.....	.....	
13,250	53,000	.001783	.000033	.....	.....	Elastic limit.
13,500	54,000	.001900	.000117	.....	.....	
13,750	55,000	.002050	.000150	.....	.....	
14,000	56,000	.002467	.000417	.....	.....	
14,250	57,000	.002833	.000366	.....	.....	
14,500	58,000	.003500	.000667	.....	.....	
14,750	59,000	.004017	.000517	.....	.....	
15,000	60,000	.004850	.000833	.....	.....	
15,500	62,000	.006083	.001233	.....	.....	
16,000	64,000	.007667	.001584	.....	.....	
16,500	66,000	.009583	.001916	.....	.....	
17,000	68,000	.010500	.000917	.....	.....	
17,500	70,000	.011833	.001333	.....	.....	
18,000	72,000	.013300	.001467	.....	.....	
18,500	74,000	.014833	.001533	.....	.....	
19,000	76,000	.016417	.001584	.....	.....	
19,500	78,000	.018083	.001666	.....	.....	
20,000	80,000	.020000	.001917	.....	.....	
20,500	82,000	.021833	.001833	.....	.....	
21,000	84,000	.024000	.002167	.....	.....	
21,500	86,000	.026250	.002250	.....	.....	
22,000	88,000	.028583	.002333	.....	.....	
22,500	90,000	.030833	.002250	.....	.....	
23,000	92,000	.0333	.002467	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0400	.0033	.....	.....	
24,500	98,000	.0467	.0067	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0667	.0100	.....	.....	
26,500	106,000	.0850	.0183	.....	.....	
26,610	106,440	.1050	.0200	.....	.....	Tensile strengtl

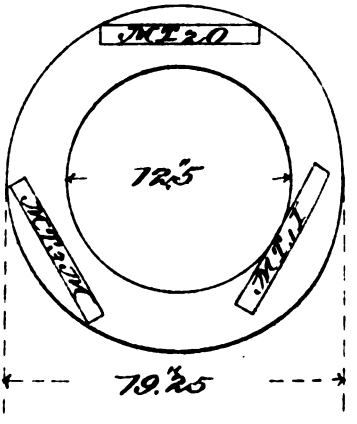
General summary.

Tensile strength per square inch of original section ..... pounds
Elastic limit per square inch of original section ..... do.
Elongation per inch after rupture ..... inch
Elongation per inch under strain at elastic limit ..... do.
Reduction in diameter at point of rupture ..... do.
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ".8
Character of broken surface ..... granular; silky ce
Elongation of inch sections ..... ".25*, ".14, ".09, ".

10" Steel B.L. Rifle No. 1

Hoop C8





H Ex 31 49 2

No. 2683.

:ks, ^{10} R, C, B T, I

meter, ″.564.

tional area, .25 square inch.

pplied loads. al.	Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50	1,000	0.	0.	0.	0.	Initial load.
50	5,000	.000150	.000150	0.	.....	
00	10,000	.000317	.000167	0.	.....	
50	15,000	.000483	.000166	0.	.....	
00	20,000	.000650	.000167	0.	.....	
50	25,000	.000833	.000183	0.	.....	
00	30,000	.001000	.000167	0.	.....	
50	35,000	.001167	.000167	0.	.....	
00	40,000	.001333	.000166	0.	.....	
50	45,000	.001483	.000150	.....	.....	
00	50,000	.001650	.000167	.....	.....	
50	51,000	.001683	.000033	.....	.....	
00	52,000	.001733	.000050	.....	.....	
50	53,000	.001767	.000034	.....	.....	
00	54,000	.001783	.000016	.....	.....	
50	55,000	.001850	.000067	.....	.....	
00	56,000	.001883	.000033	.....	.....	
50	57,000	.001950	.000067	.....	.....	Elastic limit.
00	58,000	.002117	.000167	.....	.....	
50	59,000	.002300	.000183	.....	.....	
00	60,000	.002567	.000267	.....	.....	
00	62,000	.003233	.000666	.....	.....	
00	64,000	.004000	.000767	.....	.....	
00	66,000	.005117	.001117	.....	.....	
00	68,000	.006833	.001716	.....	.....	
00	70,000	.008267	.001434	.....	.....	
00	72,000	.009833	.001566	.....	.....	
00	74,000	.011417	.001584	.....	.....	
00	76,000	.012833	.001416	.....	.....	
00	78,000	.014833	.002000	.....	.....	
00	80,000	.016500	.001667	.....	.....	
00	82,000	.018083	.001583	.....	.....	
00	84,000	.019667	.001584	.....	.....	
00	86,000	.021417	.001750	.....	.....	
00	88,000	.023333	.001916	.....	.....	
00	90,000	.025667	.002334	.....	.....	
00	92,000	.0275	.001833	.....	.....	
00	94,000	.0300	.0025	.....	.....	
00	96,000	.0333	.0033	.....	.....	
00	98,000	.0367	.0034	.....	.....	
00	100,000	.0400	.0033	.....	.....	
00	102,000	.0450	.0050	.....	.....	
00	104,000	.0500	.0050	.....	.....	
00	106,000	.0583	.0083	.....	.....	
00	108,000	.0700	.0117	.....	.....	
15	109,660	.0967	.0267	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	109,660
mit per square inch of original section	do...	57,000
on per inch after rupture	inch..	0.1133
on per inch under strain at elastic limit	do...	.001950
n in diameter at point of rupture	do...	.101
n in area after rupture, per centum of original section		33.5
of rupture		1″.17 from neck
r of broken surface		granular; silky center
m of inch sections		″.07, ″.07, ″.07, ″.08, ″.08, ″.21*

No. 2684.

Marks, $^{10\,R_1\,C_3}_{B\,T_2\,O}$
Diameter, ″.565.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001717	.000050	.....	.....	
13,250	53,000	.001750	.000033	.....	.....	
13,500	54,000	.001800	.000050	.....	.....	Elastic limit.
13,750	55,000	.002000	.000200	.....	.....	
14,000	56,000	.002383	.000383	.....	.....	
14,250	57,000	.002833	.000450	.....	.....	
14,500	58,000	.003533	.000700	.....	.....	
14,750	59,000	.004100	.000567	.....	.....	
15,000	60,000	.004933	.000833	.....	.....	
15,500	62,000	.006417	.001484	.....	.....	
16,000	64,000	.007833	.001416	.....	.....	
16,500	66,000	.009350	.001517	.....	.....	
17,000	68,000	.010667	.001317	.....	.....	
17,500	70,000	.012250	.001583	.....	.....	
18,000	72,000	.013667	.001417	.....	.....	
18,500	74,000	.015283	.001616	.....	.....	
19,000	76,000	.016833	.001550	.....	.....	
19,500	78,000	.018550	.001717	.....	.....	
20,000	80,000	.020500	.001950	.....	.....	
20,500	82,000	.022583	.002083	.....	.....	
21,000	84,000	.024500	.001917	.....	.....	
21,500	86,000	.026783	.002283	.....	.....	
22,000	88,000	.0300	.006217	.....	.....	
22,500	90,000	.0333	.0033	.....	.....	
23,000	92,000	.0367	.0034	.....	.....	
23,500	94,000	.0383	.0016	.....	.....	
24,000	96,000	.0433	.0050	.....	.....	
24,500	98,000	.0483	.0050	.....	.....	
25,000	100,000	.0533	.0050	.....	.....	
25,500	102,000	.0633	.0100	.....	.....	
26,000	104,000	.0783	.0150	.....	.....	
26,360	105,440	.1050	.0267	.....	.....	Tensile strength

General summary.

Tensile strength per square inch of original section ..... pounds.
Elastic limit per square inch of original section ..... do.
Elongation per inch after rupture ..... inch
Elongation per inch under strain at elastic limit ..... do.
Reduction in diameter at point of rupture ..... do.
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... 1″.22
Character of broken surface ..... granular; s
Elongation of inch sections ..... ″.06, ″.08, ″.09, ″.10,

No. 2685.

'ks, ^{10} R_1 C_3 / B T_2 M
meter, ".564.
;ional area, .25 square inch.

)plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
1	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000150	.000150	0.	.....	
0	10,000	.000300	.000150	0.	.....	
0	15,000	.000467	.000167	0.	.....	
0	20,000	.000633	.000166	0.	.....	
0	25,000	.000783	.000150	0.	.....	
0	30,000	.000950	.000167	0.	.....	
0	35,000	.001117	.000167	0.	.....	
0	40,000	.001283	.000166	0.	.....	
0	45,000	.001467	.000184	.....	.....	
0	50,000	.001650	.000183	.....	.....	
0	51,000	.001683	.000033	.....	.....	
0	52,000	.001717	.000034	.....	.....	
0	53,000	.001767	.000050	.....	.....	
0	54,000	.001817	.000050	.....	.....	Elastic limit.
0	55,000	.001917	.000100	.....	.....	
0	56,000	.002100	.000183	.....	.....	
0	57,000	.002333	.000233	.....	.....	
0	58,000	.002833	.000500	.....	.....	
0	59,000	.003167	.000334	.....	.....	
0	60,000	.003867	.000700	.....	.....	
0	62,000	.005200	.001333	.....	.....	
0	64,000	.006700	.001500	.....	.....	
0	66,000	.008183	.001483	.....	.....	
0	68,000	.009500	.001317	.....	.....	
0	70,000	.010017	.001417	.....	.....	
0	72,000	.012333	.001416	.....	.....	
0	74,000	.013833	.001500	.....	.....	
0	76,000	.015333	.001500	.....	.....	
0	78,000	.017000	.001667	.....	.....	
0	80,000	.018683	.001683	.....	.....	
0	82,000	.020667	.001984	.....	.....	
0	84,000	.022450	.001783	.....	.....	
0	86,000	.024667	.002217	.....	.....	
0	88,000	.026517	.001850	.....	.....	
0	90,000	.0283	.001783	.....	.....	
0	92,000	.0317	.0034	.....	.....	
0	94,000	.0350	.0033	.....	.....	
0	96,000	.0367	.0017	.....	.....	
0	98,000	.0417	.0050	.....	.....	
0	100,000	.0483	.0066	.....	.....	
0	102,000	.0533	.0050	.....	.....	
0	104,000	.0617	.0084	.....	.....	
0	106,000	.0700	.0083	.....	.....	
0	108,000	.0950	.0250	.....	.....	
0	108,240	.1117	.0167	.....	.....	Tensile strength.

General summary.

rength per square inch of original section	pounds..	108,240
nit per square inch of original section	do ..	54,000
n per inch after rupture	inch..	0.1200
n per inch under strain at elastic limit	do...	.001817
in diameter at point of rupture	do...	.064
in area after rupture, per centum of original section		21.4
f rupture		".65 from neck
of broken surface	granular; radiating from a dull spot at the circumference	
of inch sections		".18*, ".12, ". 10, ".10, ".12

No. 2686.

Marks, $^{10\,R_1\,C_3}_{M\,T_1\,I}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000650	.000167	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.001000	.000183	0.	.....	
8,750	35,000	.001150	.000150	0.	.....	
10,000	40,000	.001333	.000183	0.	.....	
11,250	45,000	.001483	.000150	.....	.....	
12,500	50,000	.001650	.000167	.....	.....	
12,750	51,000	.001683	.000033	.....	.....	
13,000	52,000	.001733	.000050	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001817	.000050	.....	.....	
13,750	55,000	.001867	.000050	.....	.....	Elastic limit.
14,000	56,000	.002000	.000133	.....	.....	
14,250	57,000	.002167	.000167	.....	.....	
14,500	58,000	.002433	.000266	.....	.....	
14,750	59,000	.002733	.000300	.....	.....	
15,000	60,000	.003333	.000600	.....	.....	
15,500	62,000	.004833	.001500	.....	.....	
16,000	64,000	.006500	.001667	.....	.....	
16,500	66,000	.008083	.001583	.....	.....	
17,000	68,000	.009583	.001500	.....	.....	
17,500	70,000	.011250	.001667	.....	.....	
18,000	72,000	.012500	.001250	.....	.....	
18,500	74,000	.014117	.001617	.....	.....	
19,000	76,000	.015667	.001550	.....	.....	
19,500	78,000	.017500	.001833	.....	.....	
20,000	80,000	.019267	.001767	.....	.....	
20,500	82,000	.021333	.002066	.....	.....	
21,000	84,000	.023333	.002000	.....	.....	
21,500	86,000	.025333	.002000	.....	.....	
22,000	88,000	.027667	.002334	.....	.....	
22,500	90,000	.0300	.002333	.....	.....	
23,000	92,000	.0333	.0033	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0400	.0033	.....	.....	
24,500	98,000	.0450	.0050	.....	.....	
25,000	100,000	.0500	.0050	.....	.....	
25,500	102,000	.0583	.0083	.....	.....	
26,000	104,000	.0683	.0100	.....	.....	
26,500	106,000	.0900	.0217	.....	.....	
26,680	106,720	.1167	.0267	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds.
Elastic limit per square inch of original section ..... do..
Elongation per inch after rupture ..... inch.
Elongation per inch under strain at elastic limit ..... do..
Reduction in diameter at point of rupture ..... do..
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... 1″.05
Character of broken surface ..... granular; si
Elongation of inch sections ..... ″.25*, ″.19, ″.12, ″.12

No. 2687.

10 R_1 C_3
) M T_2 O
ter, ".564.
nal area, .25 square inch.

led loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000133	.000133	0.	.....	
10,000	.000300	.000167	0.	.....	
15,000	.000467	.000167	0.	.....	
20,000	.000650	.000183	0.	.....	
25,000	.000800	.000150	0.	.....	
30,000	.000967	.000167	0.	.....	
35,000	.001133	.000166	0.	.....	
40,000	.001300	.000167	0.	.....	
45,000	.001500	.000200	.....	.....	
50,000	.001667	.000167	.....	.....	
51,000	.001700	.000033	.....	.....	
52,000	.001733	.000033	.....	.....	
53,000	.001800	.000067	.....	.....	Elastic limit.
54,000	.002000	.000200	.....	.....	
55,000	.002333	.000333	.....	.....	
56,000	.003083	.000750	.....	.....	
57,000	.003717	.000634	.....	.....	
58,000	.004417	.000700	.....	.....	
59,000	.005000	.000583	.....	.....	
60,000	.005700	.000700	.....	.....	
62,000	.007167	.001467	.....	.....	
64,000	.008500	.001333	.....	.....	
66,000	.009933	.001433	.....	.....	
68,000	.011333	.001400	.....	.....	
70,000	.012833	.001500	.....	.....	
72,000	.014417	.001584	.....	.....	
74,000	.016083	.001666	.....	.....	
76,000	.017667	.001584	.....	.....	
78,000	.019333	.001666	.....	.....	
80,000	.021333	.002000	.....	.....	
82,000	.023167	.001834	.....	.....	
84,000	.025333	.002166	.....	.....	
86,000	.027633	.002300	.....	.....	
88,000	.0300	.002367	.....	.....	
90,000	.0333	.0033	.....	.....	
92,000	.0367	.0034	.....	.....	
94,000	.0400	.0033	.....	.....	
96,000	.0450	.0050	.....	.....	
98,000	.0500	.0050	.....	.....	
100,000	.0567	.0067	.....	.....	
102,000	.0650	.0083	.....	.....	
104,000	.0800	.0150	.....	.....	
105,240	.1083	.0283	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	105,240
imit per square inch of original section	do ..	53,000
on per inch after rupture	inch..	0.1350
ion per inch under strain at elastic limit	do...	.001800
on in diameter at point of rupture	do...	.104
on in area after rupture, per centum of original section	..	33.5
of rupture		1".65 from neck
er of broken surface		granular; silky center
ion of inch sections		".12, ".29, ".15, ".10, ".08, ".07

No. 2688.

Marks, $\frac{10\ R_1\ C_3}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

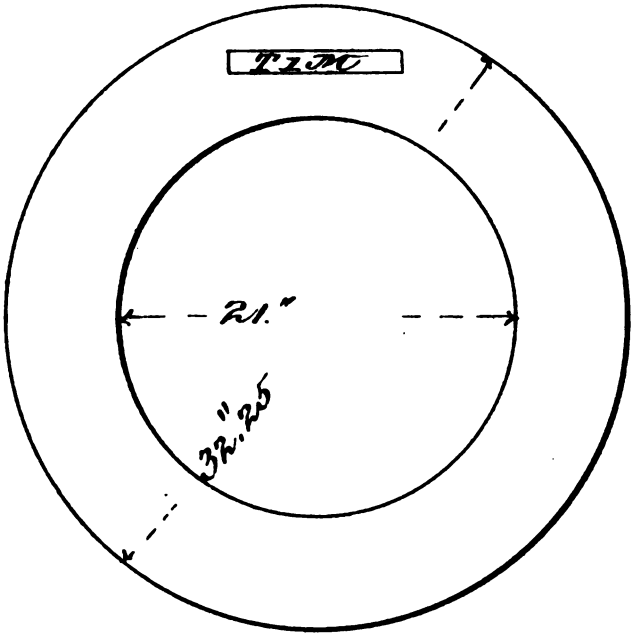
Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000283	.000150	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000817	.000184	0.	.....	
7,500	30,000	.001000	.000183	0.	.....	
8,750	35,000	.001167	.000167	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
11,250	45,000	.001517	.000184	.....	.....	
12,500	50,000	.001683	.000166	.....	.....	
12,750	51,000	.001717	.000034	.....	.....	
13,000	52,000	.001767	.000050	.....	.....	
13,250	53,000	.001817	.000050	.....	.....	Elastic limit.
13,500	54,000	.001933	.000116	.....	.....	
13,750	55,000	.002000	.000067	.....	.....	
14,000	56,000	.002500	.000500	.....	.....	
14,250	57,000	.002917	.000417	.....	.....	
14,500	58,000	.003683	.000766	.....	.....	
14,750	59,000	.004300	.000617	.....	.....	
15,000	60,000	.005117	.000817	.....	.....	
15,500	62,000	.006583	.001466	.....	.....	
16,000	64,000	.007833	.001250	.....	.....	
16,500	66,000	.009250	.001417	.....	.....	
17,000	68,000	.010667	.001417	.....	.....	
17,500	70,000	.012083	.001416	.....	.....	
18,000	72,000	.013533	.001450	.....	.....	
18,500	74,000	.015000	.001467	.....	.....	
19,000	76,000	.016617	.001617	.....	.....	
19,500	78,000	.018450	.001833	.....	.....	
20,000	80,000	.020333	.001883	.....	.....	
20,500	82,000	.022167	.001834	.....	.....	
21,000	84,000	.024167	.002000	.....	.....	
21,500	86,000	.026167	.002000	.....	.....	
22,000	88,000	.0283	.002133	.....	.....	
22,500	90,000	.0317	.0034	.....	.....	
23,000	92,000	.0333	.0016	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0400	.0033	.....	.....	
24,500	98,000	.0467	.0067	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0600	.0083	.....	.....	
26,000	104,000	.0700	.0100	.....	.....	
26,500	106,000	.0900	.0200	.....	.....	
26,620	106,480	.1083	.0183	.....	.....	Tensile strengt

General summary.

Tensile strength per square inch of original section ..... pound
Elastic limit per square inch of original section ..... do
Elongation per inch after rupture ..... incl
Elongation per inch under strain at elastic limit ..... do
Reduction in diameter at point of rupture ..... do
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... incl
Character of broken surface ..... granular; f
Elongation of inch sections ..... ″.08, ″.09, ″.10, ″.

10" Steel B. L. Rifle No. 1

Hoop D 1



H Ex 31 492

No. 2774.

8, $^{10}R_1 D_1$ $T_1 M$

ıeter, ".564.

onal area, .25 square inch.

›lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000117	.000117	0.	.....	
10,000	.000283	.000166	0.	.....	
15,000	.000433	.000150	0.	.....	
20,000	.000617	.000184	0.	.....	
25,000	.000783	.000166	0.	.....	
30,000	.000933	.000150	0.	.....	
35,000	.001100	.000167	0.	.....	
40,000	.001267	.000167	— .000017	— .000017	
45,000	.001433	.000166	.....	.....	
50,000	.001617	.000184	.....	.....	
51,000	.001650	.000033	.....	.....	
52,000	.001667	.000017	.....	.....	
53,000	.001717	.000050	.....	.....	
54,000	.001750	.000033	.....	.....	
55,000	.001783	.000033	.....	.....	
56,000	.001817	.000034	.....	.....	
57,000	.001867	.000050	.....	.....	Elastic limit.
58,000	.007333	.005466	.....	.....	
59,000	.007917	.000584	.....	.....	
60,000	.008417	.000500	.....	.....	
62,000	.010000	.001583	.....	.....	
64,000	.011750	.001750	.....	.....	
66,000	.013667	.001917	.....	.....	
68,000	.015200	.001533	.....	.....	
70,000	.017000	.001800	.....	.....	
72,000	.018967	.001967	.....	.....	
74,000	.021000	.002033	.....	.....	
76,000	.022917	.001917	.....	.....	
78,000	.025500	.002583	.....	.....	
80,000	.0283	.0028	.....	.....	
82,000	.0317	.0034	.....	.....	
84,000	.0350	.0033	.....	.....	
86,000	.0367	.0017	.....	.....	
88,000	.0400	.0033	.....	.....	
90,000	.0467	.0067	.....	.....	
92,000	.0517	.0050	.....	.....	
94,000	.0550	.0033	.....	.....	
96,000	.0650	.0100	.....	.....	
98,000	.0783	.0133	.....	.....	
100,000	.1033	.0250	.....	.....	
100,240	.1333	.0300	.....	.....	Tensile strength.

General summary.

ıvity		7.8438
		21.40
›ngth per square inch of original section	pounds	100,240
ıit per square inch of original section	do	57,000
› per inch after rupture	inch	0.1533
› per inch under strain at elastic limit	do	.001867
in diameter at point of rupture	do	.124
in area after rupture, per centum of original section		39.2
f rupture		2¼" from neck
of broken surface		silky
› of inch sections		".10, ".33*, ".17, ".12, ".11, ".09

TABULATION OF TENSION SPECIMENS FROM WHITWORTH STEI FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of f
			Pounds.	*Pounds.*	*Pr. ct.*	*Pr. ct.*	
2740	Breech.	Inside	33,000	79,600	20.0	33.5	Granular, 60 per ce 40 per cent.
2741	....do	Outside	37,000	85,760	21.7	44.6	Silky.
2739	....do	Middle.	35,000	83,880	22.0	44.6	Do.
2738	....do	....do	35,000	82,920	21.3	39.2	Silky; slightly gr
2742	..do.	Radial	31,000	80,600	15.5	27.6	Granular; dull sill
2657	Muzzle.	Inside	31,000	85,800	21.0	36.4	Granular; silky s
2658	....do	Outside.....	32,000	72,240	26.0	41.9	Silky.
2659	... do	Middle ...	33,000	78,200	23.7	27.6	Granular; dull sill
2660	.. do	....do.	30,000	77,720	22.7	30.6	Granular, 50 per ce 50 per cent.
2661	....do	Radial.....	23,000	79,520	23.0	30.6	Granular, with d metal.

TABULATION OF COMPRESSION SPECIMENS FROM WHITWORT TUBE FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of fail
			Pounds.	*Pounds.*	
699	Breech.	Inside	35,000	73,720	Triple flexure.
700	....do	Outside.....	40,000	81,000	Do.
701	....do	Middle	33,000	73,500	Do.
697	....do	Radial	34,000	82,760	Do.
698	....do	....do	34,000	80,840	Do.
692	Muzzle.	Inside	30,000	70,300	Do.
693	....do	Outside.....	28,000	61,960	Do.
694	....do	Middle	27,000	69,200	Do.
695	... do.	Radial	28,000	78,760	Do.
696	....do	....do	31,000	79,340	Do.

ITION OF TENSION SPECIMENS FROM WHITWORTH STEEL JACKET FOR 10-INCH STEEL B. L. RIFLE NO. 1.

Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
		Pounds.	*Pounds.*	*Pr ct.*	*Pr ct.*	
Breech	Inside	39,000	94,560	12.3	18.3	Granular.
..do	Outside	45,000	91,240	18.0	47.2	Silky.
..do	Middle	34,000	85,440	16.7	33.5	Granular; dull spot.
..do	....do	30,000	84,040	19.0	33.5	Do.
..do	Radial	36,000	87,120	13.3	18.3	Do.
Muzzle	Inside	37,000	82,000	20.0	49.7	Silky.
..do	Outside	44,000	90,000	19.7	47.2	Silky; trace of granulation.
..do	Middle	39,000	80,400	26.0	44.6	Do.
..do	....do	38,000	80,800	27.0	49.7	Silky.
..do	Radial	34,000	80,400	22.7	44.6	Do.

ITION OF COMPRESSION SPECIMENS FROM WHITWORTH STEEL JACKET FOR 10-INCH STEEL B. L. RIFLE NO. 1.

Position in gun.	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.	Remarks.
		Pounds.	*Pounds.*		
Breech	Inside	60,000	93,200	Triple flexure	
...do	Outside	48,000	81,100	....do	
...do	Middle	32,000	76,320	....do	
...do	Radial	36,000	80,520	....do	Specific gravity (outside), 7.8635.
...do	....do	35,000	81,480	.. do	Specific gravity (inside), 7.8610.
Muzzle	Initial	45,000	81,600	....do	
...do	Outside	47,000	86,400	.. do	
...do	Middle	36,000	73,800	... do	
...do	Radial	42,000	71,700	....do	
...do	....do	42,000	72,200	....do	Specific gravity, 7.8677.

TABULATION OF SPECIMENS FROM HOOPS FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.	Specific gravity.	Hardness.	Remarks.
			Pounds.	*Pounds.*	*Per cent.*	*Per cent.*				
2746	Trunnion hoop	Inside	39,000	82,960	13.3	18.4	Silky			Whitworth steel.
2747	do	Outside	42,000	85,440	17.3	59.3	do			Do.
2748	do	Middle	35,000	79,520	18.3	57.0	do			Do.
2749	do	do	43,000	83,920	17.5	57.0	do			Do.
2678	Hoop A_4	do	58,000	104,240	14.0	41.9	do			
2681	Hoop A_5	do	55,000	97,840	16.7	49.7	do			
2777	Hoop A_5	Inside	59,000	104,760	15.2	49.7	do	7.8424	20.70	
2602	Hoop B_2	Middle	62,000	106,280	16.0	41.9	do			
2603	Hoop B_2	Outside	66,000	115,160	13.8	33.5	Silky, with fine granulation			
2604	Hoop B_2	Middle	65,000	113,680	14.7	27.6	do			
2743	Hoop B_2	do	61,000	108,640	15.0	41.9	Fine silky			
2744	Hoop B_2	Inside	65,000	113,920	11.5	36.4	Silky; traces of granulation			
2775	Hoop B_2	Middle	53,000	98,320	18.2	47.2	Silky			
2682	Hoop B_4	do	61,000	108,120	16.5	49.7	do	7.8432	24.26	
2679	Hoop B_5	do	54,000	102,000	15.3	44.6	do			
2695	Hoop B_5	do	57,000	106,440	12.7	39.2	do	7.8888	24.26	
2745	Hoop B_6	do	57,000	98,320	14.5	27.6	Granular, 50 per cent.; silky, 50 per cent.			
2615	Hoop B_7	do	63,000	107,200	17.8	41.9	Silky			
2822	Hoop B_7	do	62,000	109,560	15.3	44.6	Fine silky	7.8419	21.64	
2576	Hoop C_1	Inside	68,000	108,720	15.5	30.6	Silky			
2680	Hoop C_1	Middle	64,000	110,040	15.5	47.2	Fine silky	7.8376	24.83	
2778	Hoop C_2	do	64,000	106,800	7.7	11.8	Granular, with silky metal	7.8491	21.89	
2646	Hoop C_3	do	62,000	100,000	16.3	49.7	Silky			
2208	Hoop C_5	do	47,000	91,370	14.8	34.7	Granular; dull spot	7.8546	18.19	
2762	Hoop C_5	Inside	67,000	118,880	10.8	27.6	do			
2763	Hoop C_5	Outside	58,000	113,800	10.3	15.0	do			
2764	Hoop C_5	Middle	59,000	110,800	13.3	33.5	Granular; silky center			
2765	Hoop C_5	Inside	55,000	106,000	6.8	8.4	Granular; flaky spot			
2766	Hoop C_5	Outside	60,000	118,480	11.5	27.6	Granular; silky center			
2767	Hoop C_5	Middle	52,000	106,560	12.5	30.6	do			
2750	Hoop C_6	Inside	61,000	111,640	11.7	33.5	Granular; silky spot			
2751	Hoop C_6	Outside	56,000	110,080	12.3	33.5	Granular; silky center			
2752	Hoop C_6	Middle	57,000	110,520	14.7	33.5	do			

2781	Hoop C_5	Middle	53,000	106,440	12.0	30.6	do		
2683	Hoop C_5	Inside	57,000	109,000	11.3	33.5	Granular; silky center		
2684	Hoop C_5	Outside	54,000	105,440	13.0	36.4	do		
2685	Hoop C_5	Middle	54,000	108,240	12.0	21.4	Granular; dull spot		
2686	Hoop C_5	Inside	55,000	108,720	15.0	32.5	Granular; silky center		
2687	Hoop C_5	Outside	52,000	105,240	13.5	33.5	do		
2688	Hoop C_5	Middle	53,000	106,480	13.0	30.6	do		
2774	Hoop D_1	do	57,000	100,240	15.3	39.2	Silky	7.8438	21.40

10-INCH STEEL WIRE WOUND RIFLE.

ADDITIONAL SPECIMENS FROM

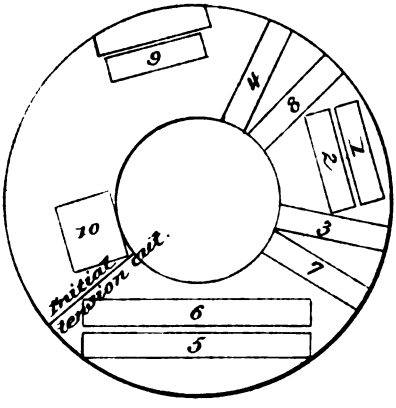
WHITWORTH STEEL TUBE.

TESTS BY TENSION OF UPSET SPECIMENS, AND BULGING TESTS OF DISKS.

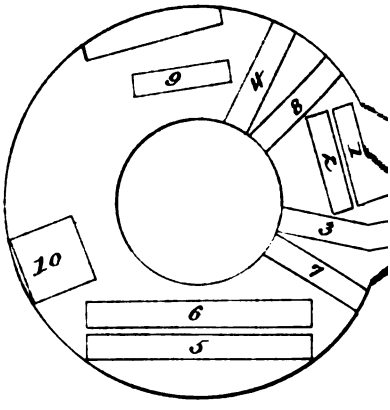
10" Steel wire-wound Rifle.

Tube

Breech



Muzzle



H Ex 31 492

10-INCH STEEL WIRE WOUND RIFLE.

ADDITIONAL SPECIMENS FROM WHITWORTH STEEL TUBE.

No. 527.

arks, 9 B.
ngth, 4″.10.
iameter, 1″.039.
ctional area, ″.848 square inch.
ompression load of 39,300 pounds=46,340 pounds per square inch
ired to shorten specimen 1 per centum of length.
iddle diameter after compressing, 1″.0445; enlargement, ″.0055.

No. 528.

larks, 9 M.
ength, 4″.10.
iameter, ″.974.
ectional area, ″.745 square inch.
ompression load of 29,600 pounds=39,730 pounds per square inch
uired to shorten specimen 1 per centum of length.
Iiddle diameter after compressing, ″.9797; enlargement, ″.0057.

No. 990.

Marks, 9 B
Diameter, ".564.
Sectional area, .25 square inch.
This specimen and one following were previously shortened
pression 1 per centum of length.
Tested by tension seven days after the compression test.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	.....	.....	
2,500	10,000	.000350	.000250	.....	.....	
3,750	15,000	.000500	.000150	.....	.....	
5,000	20,000	.000650	.000150	.....	.....	
5,500	22,000	.000650	0.	.....	.....	
5,750	23,000	.000700	.000050	.....	.....	
6,000	24,000	.000750	.000050	.....	.....	Elastic limit.
6,250	25,000	.001150	.000400	.000400	.000400	
6,500	26,000	.001450	.000300	.....	.....	
6,750	27,000	.001700	.000250	.....	.....	
7,000	28,000	.001950	.000250	.....	.....	
7,250	29,000	.002200	.000250	.....	.....	
7,500	30,000	.002600	.000400	.001700	.001300	
7,750	31,000	.003150	.000550	.....	.....	
8,000	32,000	.003700	.000550	.....	.....	
8,250	33,000	.003950	.000250	.....	.....	
8,500	34,000	.004650	.000700	.....	.....	
8,750	35,000	.005100	.000450	.003900	.002200	
9,000	36,000	.005850	.000750	.....	.....	
9,250	37,000	.006250	.000400	.....	.....	
9,500	38,000	.006600	.000350	.....	.....	
9,750	39,000	.007200	.000600	.....	.....	
10,000	40,000	.008150	.000950	.006650	.002750	
10,250	41,000	.008950	.000800	.....	.....	
10,500	42,000	.009500	.000550	.....	.....	
10,750	43,000	.010050	.000550	.....	.....	
11,000	44,000	.010800	.000750	.....	.....	
11,250	45,000	.011800	.001000	.....	.....	
11,500	46,000	.012550	.000750	.....	.....	
11,750	47,000	.013750	.001200	.....	.....	
12,000	48,000	.014750	.001000	.....	.....	
12,250	49,000	.015750	.001000	.....	.....	
12,500	50,000	.017500	.001750	.....	.....	
13,000	52,000	.019650	.002150	.....	.....	
13,500	54,000	.022000	.002350	.....	.....	
14,000	56,000	.025000	.003000	.....	.....	
14,500	58,000	.028250	.003250	.....	.....	
15,000	60,000	.031250	.003000	.....	.....	
15,500	62,000	.034900	.003650	.....	.....	
16,000	64,000	.038650	.003750	.....	.....	
16,500	66,000	.043250	.004600	.....	.....	
17,000	68,000	.048750	.005500	.....	.....	
17,500	70,000	.059000	.010250	.....	.....	
18,000	72,000	.0650	.0060	.....	.....	
18,500	74,000	.0700	.0050	.....	.....	
19,000	76,000	.0850	.0150	.....	.....	
19,500	78,000	.1050	.0200	.....	.....	
19,920	79,680	.1650	.0600	.....	.....	Tensile strengt
18,200	.....	.....	.....	.....	.....	Load at time o

General summary.

Tensile strength per square inch of original section ..... pound
Elastic limit per square inch of original section ..... do
Elongation per inch after rupture ..... inc
Elongation per inch under strain at elastic limit ..... do
Reduction in diameter at point of rupture ..... do
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ¾ inch from mi
Character of broken surface ..... silky; interspersed with fine gra
Elongation of inch sections .....

No. 991.

Marks, 9 M
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	0.	.....	
3,750	15,000	.000500	.000200	0.	.....	
5,000	20,000	.000950	.000450	.000350	.000350	Elastic limit probably 19,000 pounds per square inch.
5,250	21,000	.001050	.000100	.....	.....	
5,500	22,000	.001250	.000200	.....	.....	
5,750	23,000	.001500	.000250	.....	.....	
6,000	24,000	.001750	.000250	.....	.....	
6,250	25,000	.001950	.000200	.....	.....	
6,500	26,000	.002400	.000450	.....	.....	
6,750	27,000	.002750	.000350	.....	.....	
7,000	28,000	.003250	.000500	.....	.....	
7,250	29,000	.003650	.000400	.....	.....	
7,500	30,000	.004350	.000700	.003350	.003000	
7,750	31,000	.004900	.000550	.....	.....	
8,000	32,000	.005400	.000500	.....	.....	
8,250	33,000	.006100	.000700	.....	.....	
8,500	34,000	.006850	.000750	.....	.....	
8,750	35,000	.007650	.000800	.006400	.003050	
9,000	36,000	.008400	.000750	.....	.....	
9,250	37,000	.009150	.000750	.....	.....	
9,500	38,000	.010050	.000900	.....	.....	
9,750	39,000	.010950	.000900	.....	.....	
10,000	40,000	.011950	.001000	.....	.....	
10,500	42,000	.015000	.003050	.....	.....	
11,000	44,000	.017700	.002700	.....	.....	
11,500	46,000	.020750	.003050	.....	.....	
12,000	48,000	.024500	.003750	.....	.....	
12,500	50,000	.028500	.004000	.....	.....	
13,000	52,000	.032900	.004400	.....	.....	
13,500	54,000	.038500	.005600	.....	.....	
14,000	56,000	.044750	.006250	.....	.....	
14,500	58,000	.051500	.006750	.....	.....	
15,000	60,000	.059000	.007500	.....	.....	
15,500	62,000	.0650	.0060	.....	.....	
16,000	64,000	.0850	.0200	.....	.....	
16,500	66,000	.1000	.0150	.....	.....	
17,000	68,000	.1450	.0450	.....	.....	
17,130	68,520	.2000	.0550	.....	.....	Tensile strength.
14,700	.....	.....	.....	.....	.....	Load at time of rupture.

General summary.

Tensile strength per square inch of original section	pounds	68,520
Elastic limit per square inch of original section (probably)	do	19,000
Elongation per inch after rupture	inch	0.3400
Reduction in diameter at point of rupture	do	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture	¾ inch from middle of stem; oblique	
Character of broken surface		silky
Elongation of inch sections		".43*, ."25

BULGING TESTS.

[Specimens 3" square by ".20 thick.]

Tested by being placed upon a ring of steel 2½ inches interior di eter and distorted by a plunger 1½ inches diameter with hemisphe end.

Pressure applied and continued till the specimen cracked.

No. 542.

Marks, B 10.

Bulged ".46, measured after fracture.

Cracked across face, which remained open ".03 at the middle of length.

No. 543.

Marks, M 10.

Bulged ".79, measured after fracture.

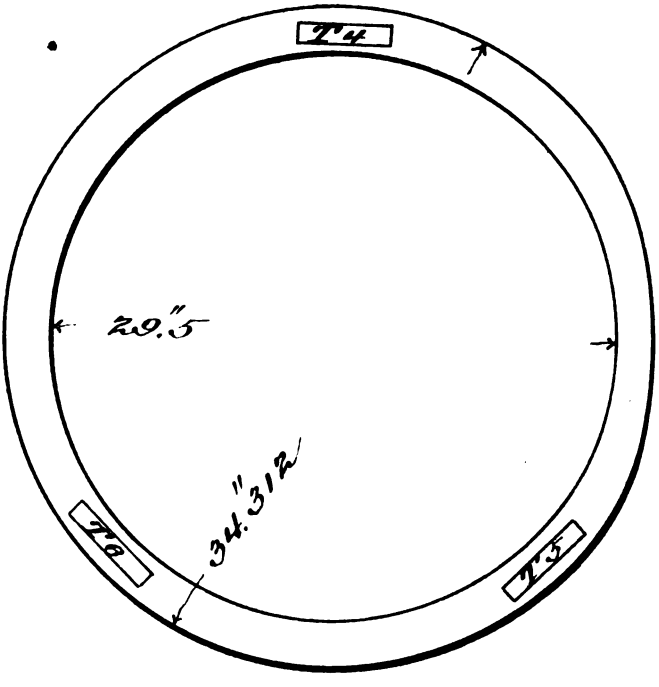
Cracked across face, which remained open ".25 at the middle of length.

Appearance of fracture, granular.

A plunger with 1 inch hemispherical end was first employed in bu ing this disk ".4, after which the 1½-inch plunger was used.

10" Steel Wire-wound Rifl

Sleeve



H Ex 31 49 2

NEW SLEEVE.

No. 2561.

ks, $\frac{10\ S_2}{T_4}$
neter, ″.564.
ional area, .25 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
L.	Per square inch.					
ls.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000100	.000100	0.	.....	
0	10,000	.000233	.000133	0.	.....	
0	15,000	.000433	.000200	0.	.....	
0	20,000	.000600	.000167	0.	.....	
0	25,000	.000767	.000167	0.	.....	
0	30,000	.000933	.000166	0.	.....	
0	35,000	001167	.000234	.....	.....	
0	40,000	.001400	.000233	.....	.....	
0	45,000	.001533	.000133	.....	.....	
0	50,000	.001700	.000167	.....	.....	Elastic limit.
0	51,000	.001800	.000100	.....	.....	
0	52,000	.001933	.000133	.....	.....	
0	53,000	.002033	.000100	.....	.....	
0	54,000	.004667	.002634	.....	.....	
0	55,000	.005833	.001166	.....	.....	
0	56,000	.006667	.000834	.....	.....	
0	57,000	.007600	.000933	.....	.....	
0	58,000	.008700	.001100	.....	.....	
0	59,000	.010000	.001300	.....	.....	
0	60,000	.010833	.000833	.....	.....	
0	62,000	.012667	.001834	.....	.....	
0	64,000	.014733	.002066	.....	.....	
0	66,000	.016767	.002034	.....	.....	
0	68,000	.019000	.002233	.....	.....	
0	70,000	.021000	.002000	.....	.....	
0	72,000	.023433	.002433	.....	.....	
0	74,000	.026167	.002734	.....	.....	
0	76,000	.028733	.002566	.....	.....	
0	78,000	.032000	.003267	.....	.....	
0	80,000	.0367	.0047	.....	.....	
0	82,000	.0400	.0033	.....	.....	
0	84,000	.0433	.0033	.....	.....	
0	86,000	.0467	.0034	.....	.....	
0	88,000	.0567	.0100	.....	.....	
0	90,000	.0667	.0100	.....	.....	
0	92,000	.0800	.0133	.....	.....	
70	93,880	.1300	.0500	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	93,880
mit per square inch of original section	do...	50,000
n per inch after rupture	inch..	0.2100
n per inch under strain at elastic limit	do...	.001700
in diameter at point of rupture	do...	.154
in area after rupture, per centum of original section		47.2
f rupture		1″.60 from neck
of broken surface	silky; opened cracks in surface of stem	
of inch sections		″.15, ′.27*, ″.11

No. 2562.

Marks, $^{10}\,S_2$ / T_5
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000400	.000133	0.	.....	
5,000	20,000	.000600	.000200	0.	.....	
6,250	25,000	.000800	.000200	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001167	.000200	.....	.....	
10,000	40,000	.001333	.000166	.....	.....	
11,250	45,000	.001467	.000134	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001600	.000067	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001667	.000034	.....	.....	Elastic limit.
12,750	51,000	.001767	.000100	.....	.....	
13,000	52,000	.002500	.000733	.....	.....	
13,250	53,000	.004300	.001800	.....	.....	
13,500	54,000	.006300	.002000	.....	.....	
13,750	55,000	.007067	.000767	.....	.....	
14,000	56,000	.007933	.000866	.....	.....	
14,250	57,000	.008833	.000900	.....	.....	
14,500	58,000	.009867	.001034	.....	.....	
14,750	59,000	.010900	.001033	.....	.....	
15,000	60,000	.012167	.001267	.....	.....	
15,500	62,000	.014133	.001966	.....	.....	
16,000	64,000	.016033	.001900	.....	.....	
16,500	66,000	.018167	.002134	.....	.....	
17,000	68,000	.020500	.002333	.....	.....	
17,500	70,000	.023000	.002500	.....	.....	
18,000	72,000	.025433	.002433	.....	.....	
18,500	74,000	.028600	.003167	.....	.....	
19,000	76,000	.031333	.002733	.....	.....	
19,500	78,000	.034667	.003334	.....	.....	
20,000	80,000	.0400	.005333	.....	.....	
20,500	82,000	.0433	.0033	.....	.....	
21,000	84,000	.0500	.0067	.....	.....	
21,500	86,000	.0567	.0067	.....	.....	
22,000	88,000	.0633	.0066	.....	.....	
22,500	90,000	.0767	.0134	.....	.....	
23,000	92,000	.1000	.0233	.....	.....	
23,080	92,320	.1300	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds
Elastic limit per square inch of original section ..... do.
Elongation per inch after rupture ..... inch
Elongation per inch under strain at elastic limit ..... do.
Reduction in diameter at point of rupture ..... do.
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ".90
Character of broken surface ..... silky; opened small cracks in surfa
Elongation of inch sections ..... ".09,

No. 2563.

rks, $\frac{10\,S_2}{T_6}$
meter, ".564.
tional area, .25 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
L	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000100	.000100	0.	.....	
0	10,000	.000267	.000167	0.	.....	
0	15,000	.000433	.000166	0.	.....	
0	20,000	.000600	.000167	0.	.....	
0	25,000	.000800	.000200	0.	.....	
0	30,000	.000967	.000167	0.	.....	
0	35,000	.001100	.000133	.....	.....	
0	40,000	.001267	.000167	.....	.....	
0	45,000	.001433	.000166	.....	.....	
0	46,000	.001500	.000067	.....	.....	
0	47,000	.001567	.000067	.....	.....	
0	48,000	.001633	.000066	.....	.....	
0	49,000	.001667	.000034	.....	.....	
0	50,000	.001700	.000033	.....	.....	
0	51,000	.001733	.000033	.....	.....	Elastic limit.
0	52,000	.001867	.000134	.....	.....	
0	53,000	.002867	.001000	.....	.....	
00	54,000	.005333	.002466	.....	.....	
50	55,000	.006600	.001267	.....	.....	
00	56,000	.007533	.000933	.....	.....	
50	57,000	.008367	.000834	.....	.....	
00	58,000	.009500	.001133	.....	.....	
50	59,000	.010500	.001000	.....	.....	
00	60,000	.011500	.001000	.....	.....	
00	62,000	.013167	.001667	.....	.....	
00	64,000	.015333	.002166	.....	.....	
00	66,000	.017433	.002100	.....	.....	
00	68,000	.019833	.002400	.....	.....	
00	70,000	.022167	.002334	.....	.....	
00	72,000	.024667	.002500	.....	.....	
00	74,000	.027500	.002833	.....	.....	
00	76,000	.030667	.003167	.....	.....	
00	78,000	.033567	.002900	.....	.....	
00	80,000	.037167	.003600	.....	.....	
00	82,000	.0400	.002833	.....	.....	
00	84,000	.0467	.0067	.....	.....	
00	86,000	.0567	.0100	.....	.....	
00	88,000	.0633	.0066	.....	.....	
00	90,000	.0700	.0067	.....	.....	
00	92,000	.0933	.0233	.....	.....	
00	92.400	.....	.....	.....	.....	Tensile strength.

General summary.

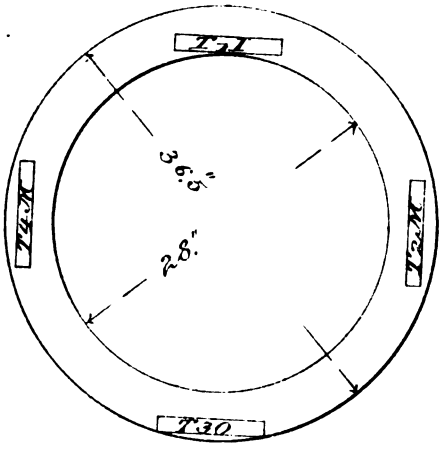
strength per square inch of original section	pounds..	92,400
limit per square inch of original section	do...	51,000
ion per inch after rupture	inch..	0.0967
ion per inch under strain at elastic limit	do...	.001733
on in diameter at point of rupture	do...	.044
on in area after rupture, per centum of original section		15.0
of rupture		".40 from neck

er of broken surface, granular; radiating from a flaky spot at the circumference; opened small
in the surface of stem.

ion of inch sections ".07, ".08, ".14*

10" Cast Iron Wire-wound Rifle J

Steel hoop



H Ex 31 492

SPECIMENS FROM EDGE OF HOOP.

No. 2642.

WR, H
T, I
; ".564.
area, .25 square inch.

Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Inch.	*Inch.*	*Inch.*	*Inch.*	
0.	0.	0.	0.	Initial load.
.000133	.000133	0.		
.000317	.000184	0.		
.000483	.000166	0.		
.000650	.000167	0.		
.000817	.000167	0.		
.000983	.000166	0.		
.001150	.000167			
.001317	.000167			
.001450	.000133			
.001633	.000183			
.001667	.000034			
.001683	.000016			
.001717	.000034			
.001783	.000066			
.001850	.000067			
.001883	.000033			Elastic limit.
.002017	.000134			
.002300	.000283			
.002483	.000183			
.002850	.000367			
.004000	.001150			
.005217	.001217			
.006867	.001650			
.008250	.001383			
.010000	.001750			
.011500	.001500			
.013083	.001583			
.014917	.001834			
.016667	.001750			
.018667	.002000			
.020500	.001833			
.022500	.002000			
.024833	.002333			
.027000	.002167			
.0300	.0030			
.0333	.0033			
.0367	.0034			
.0400	.0033			
.0450	.0050			
.0500	.0050			
.0550	.0050			
.0667	.0117			
.0833	.0166			
.1033	.0200			Tensile strength.

General summary.

nare inch of original section	pounds	106,720
inch of original section	do	56,000
er rupture	inch	0.1367
ier strain at elastic limit	do	.001883
at point of rupture	do	.114
rupture, per centum of original section		36.4
		".40 from middle of stem
rface		granular; dull center
ions		".07, ".09, ".14, ".29*, ".13, ".10

No. 2643.

Marks, $^{10}\,\mathrm{W}\,\mathrm{R}_1\,\mathrm{H}$ / $\mathrm{T}_2\,\mathrm{M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remar
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	0.	.....	
3,750	15,000	.000467	.000134	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	
14,000	56,000	.001867	.000050	.....	.....	
14,250	57,000	.001917	.000050	.....	.....	Elastic limit.
14,500	58,000	.002050	.000133	.....	.....	
14,750	59,000	.002167	.000117	.....	.....	
15,000	60,000	.002433	.000266	.....	.....	
15,500	62,000	.003083	.000650	.....	.....	
16,000	64,000	.004167	.001084	.....	.....	
16,500	66,000	.005450	.001283	.....	.....	
17,000	68,000	.006867	.001417	.....	.....	
17,500	70,000	.008333	.001466	.....	.....	
18,000	72,000	.009667	.001334	.....	.....	
18,500	74,000	.011167	.001500	.....	.....	
19,000	76,000	.012667	.001500	.....	.....	
19,500	78,000	.014217	.001550	.....	.....	
20,000	80,000	.015917	.001700	.....	.....	
20,500	82,000	.017500	.001583	.....	.....	
21,000	84,000	.019333	.001833	.....	.....	
21,500	86,000	.021333	.002000	.....	.....	
22,000	88,000	.023183	.001850	.....	.....	
22,500	90,000	.025667	.002484	.....	.....	
23,000	92,000	.0283	.002633	.....	.....	
23,500	94,000	.0317	.0034	.....	.....	
24,000	96,000	.0350	.0033	.....	.....	
24,500	98,000	.0367	.0017	.....	.....	
25,000	100,000	.0383	.0016	.....	.....	
25,500	102,000	.0450	.0067	.....	.....	
26,000	104,000	.0500	.0050	.....	.....	
26,500	106,000	.0550	.0050	.....	.....	
27,000	108,000	.0650	.0100	.....	.....	
27,500	110,000	.0817	.0167	.....	.....	
27,710	110,840	.1017	.0200	.....	.....	Tensile stren

General summary.

Tensile strength per square inch of original section ..... pou
Elastic limit per square inch of original section .....
Elongation per inch after rupture i
Elongation per inch under strain at elastic limit .....
Reduction in diameter at point of rupture .....
Reduction in area after rupture, per centum of original section .....
Position of rupture .....
Character of broken surface ..... granul
Elongation of inch sections ..... ″.08, ″.20*, ″.17,

No. 2644.

rks, $^{10}\frac{W\ R_1\ H}{T_2\ O}$
meter, ″.564.
tional area, .25 square inch.

pplied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
al.	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
250	5,000	.000133	.000133	0.	.....	
500	10,000	.000283	.000150	0.	.....	
750	15,000	.000450	.000167	0.	.....	
000	20,000	.000617	.000167	0.	.....	
250	25,000	.000783	.000166	0.	.....	
500	30,000	.000950	.000167	0.	.....	
750	35,000	.001117	.000167	0.	.....	
000	40,000	.001300	.000183	0.	.....	
250	45,000	.001467	.000167	0.	.....	
500	50,000	.001633	.000166	.....	.....	
750	51,000	.001683	.000050	.....	.....	
000	52,000	.001700	.000017	.....	.....	
250	53,000	.001717	.000017	.....	.....	
500	54,000	.001767	.000050	.....	.....	
750	55,000	.001800	.000033	.....	.....	
000	56,000	.001817	.000017	.....	.....	
250	57,000	.001867	.000050	.....	.....	
500	58,000	.001900	.000033	.....	.....	
750	59,000	.001950	.000050	.....	.....	Elastic limit.
000	60,000	.002017	.000067	.....	.....	
500	62,000	.002283	.000266	.....	.....	
000	64,000	.002833	.000550	.....	.....	
500	66,000	.003667	.000834	.....	.....	
000	68,000	.004817	.001150	.....	.....	
500	70,000	.006167	.001350	.....	.....	
000	72,000	.007417	.001250	.....	.....	
500	74,000	.008850	.001433	.....	.....	
000	76,000	.010517	.001667	.....	.....	
500	78,000	.012067	.001550	.....	.....	
000	80,000	.013550	.001483	.....	.....	
500	82,000	.015167	.001617	.....	.....	
000	84,000	.016667	.001500	.....	.....	
500	86,000	.018500	.001833	.....	.....	
000	88,000	.020217	.001717	.....	.....	
500	90,000	.022333	.002116	.....	.....	
000	92,000	.0233	.000967	.....	.....	
500	94,000	.0267	.0034	.....	.....	
000	96,000	.0300	.0033	.....	.....	
500	98,000	.0317	.0017	.....	.....	
000	100,000	.0333	.0016	.....	.....	
500	102,000	.0383	.0050	.....	.....	
000	104,000	.0433	.0050	.....	.....	
500	106,000	.0483	.0050	.....	.....	
000	108,000	.0533	.0050	.....	.....	
500	110,000	.0617	.0084	.....	.....	
000	112,000	.0700	.0083	.....	.....	
000	114,000	.0950	.0250	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	114,000
mit per square inch of original section	do...	59,000
on per inch after rupture	inch..	0.1200
on per inch under strain at elastic limit	do...	.001950
n in diameter at point of rupture	do...	.084
n in area after rupture, per centum of original section		27.6
of rupture		1″.70 from neck
r of broken surface		granular; dull center
m of inch sections		″.10, ″.25*, ″.12, ″.10, ″.09, ″.06

No. 2645.

Marks, $^{10\ W\ R_1\ H}_{T_4\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	.000017	.000017	
2,500	10,000	.000300	.000167	.000017	0.	
3,750	15,000	.000467	.000167	.000017	0.	
5,000	20,000	.000633	.000166	.000017	0.	
6,250	25,000	.000800	.000167	.000017	0.	
7,500	30,000	.000967	.000167	.000017	0.	
8,750	35,000	.001133	.000166	.000017	0.	
10,000	40,000	.001300	.000167	.000017	0.	
11,250	45,000	.001467	.000167	.000033	.000016	
12,500	50,000	.001633	.000166	.000033	0.	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001800	.000067	.....	.....	
13,750	55,000	.001850	.000050	.....	.....	
14,000	56,000	.001900	.000050	.....	.....	Elastic limit.
14,250	57,000	.002050	.000150	.....	.....	
14,500	58,000	.002283	.000233	.....	.....	
14,750	59,000	.002517	.000234	.....	.....	
15,000	60,000	.002833	.000316	.....	.....	
15,500	62,000	.003733	.000900	.....	.....	
16,000	64,000	.004850	.001117	.....	.....	
16,500	66,000	.006133	.001283	.....	.....	
17,000	68,000	.007467	.001334	.....	.....	
17,500	70,000	.008950	.001483	.....	.....	
18,000	72,000	.010467	.001517	.....	.....	
18,500	74,000	.012000	.001533	.....	.....	
19,000	76,000	.013433	.001433	.....	.....	
19,500	78,000	.015183	.001750	.....	.....	
20,000	80,000	.016850	.001667	.....	.....	
20,500	82,000	.018417	.001567	.....	.....	
21,000	84,000	.020500	.002083	.....	.....	
21,500	86,000	.022500	.002000	.....	.....	
22,000	88,000	.024617	.002117	.....	.....	
22,500	90,000	.027033	.002416	.....	.....	
23,000	92,000	.0300	.002967	.....	.....	
23,500	94,000	.0317	.0017	.....	.....	
24,000	96,000	.0350	.0033	.....	.....	
24,500	98,000	.0383	.0033	.....	.....	
25,000	100,000	.0433	.0050	.....	.....	
25,500	102,000	.0483	.0050	.....	.....	
26,000	104,000	.0517	.0034	.....	.....	
26,500	106,000	.0617	.0100	.....	.....	
27,000	108,000	.0733	.0116	.....	.....	
27,500	110,000	.0983	.0250	.....	.....	
27,600	110,400	.1000	.0017	.....	.....	Tensile strengt

General summary.

Tensile strength per square inch of original section ..... **pound**
Elastic limit per square inch of original section ..... **do**
Elongation per inch after rupture ..... **incl**
Elongation per inch under strain at elastic limit ..... **do**
Reduction in diameter at point of rupture ..... **do**
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... **′.25 from mi**
Character of broken surface .....
Elongation of inch sections ..... **″.10, ″.15, ″.25*, ″**

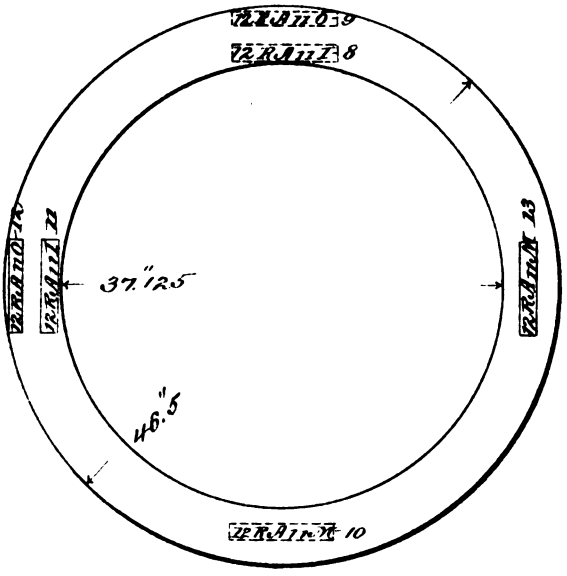
12-INCH CAST-IRON B. L. RIFLE,

HOOPED AND TUBED WITH STEEL.

1097

12" Cast Iron B. L. Rifle, hooped a
tubed with steel.

Hoop A11



H Ex 31 49 2

H CAST-IRON B. L. RIFLE, HOOPED AND TUBED WITH STEEL.

ADDITIONAL SPECIMENS FROM NEW HOOP.

No. 1021.

:8, ^{12}R A_{11} / I_{11}

ıeter, ″.564.

onal area, .25 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
.	Per square inch.					
ı.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
)	1,000	0.	0.	0.	0.	Initial load.
)	5,000	.006167	.000167	0.	.....	
)	10,000	.000333	.000166	0.	.....	
)	15,000	.000467	.000134	0.	.....	
)	20,000	.000650	.000183	0.	.....	
)	25,000	.000817	.000167	0.	.....	
)	30,000	.000983	.000166	.000017	.000017	
)	35,000	.001150	.000167	.000017	0.	
)	40,000	.001300	.000150	.000033	.000016	
)	41,000	.001333	.000033	.....	.....	
)	42,000	.001367	.000034	.....	.....	
)	43,000	.001383	.000016	.....	.....	
)	44,000	.001417	.000034	.....	.....	
)	45,000	.001450	.000033	.000033	0.	
)	46,000	.001517	.000067	.....	.....	
)	47,000	.001550	.000033	.....	.....	
)	48,000	.001600	.000050	.....	.....	
)	49,000	.001633	.000033	.....	.....	
)	50,000	.001700	.000067	.000067	.000034	
)	51,000	.001733	.000033	.....	.....	
)	52,000	.001783	.000050	.....	.....	Elastic limit.
)	53,000	.001867	.000084	.....	.....	
)	54,000	.001950	.000083	.....	.....	
)	55,000	.002050	.000100	.000217	.000150	
)	56,000	.002233	.000183	.....	.....	
)	57,000	.002367	.000134	.....	.....	
)	58,000	.002600	.000233	.....	.....	
)	59,000	.002783	.000183	.....	.....	
)	60,000	.002983	.000200	.000900	.000683	
)	62,000	.003867	.000884	.....	.....	
)	64,000	.004967	.001100	.....	.....	
)	66,000	.006083	.001116	.....	.....	
)	68,000	.007583	.001500	.....	.....	
)	70,000	.009033	.001450	.....	.....	
)	72,000	.010833	.001800	.....	.....	
)	74,000	.012667	.001834	.....	.....	
)	76,000	.014333	.001666	.....	.....	
)	78,000	.016183	.001850	.....	.....	
)	80,000	.018100	.001917	.....	.....	
)	82,000	.020123	.002033	.....	.....	
)	84,000	.022500	.002367	.....	.....	
)	86,000	.024100	.001600	.....	.....	
)	88,000	.027500	.003400	.....	.....	
)	90,000	.029683	.002183	.....	.....	
)	92,000	.032667	.002984	.....	.....	
)	94,000	.036000	.003333	.....	.....	
)	96,000	.0383	.0023	.....	.....	
)	98,000	.0433	.0050	.....	.....	
)	100,000	.0500	.0067	.....	.....	
)	102,000	.0550	.0050	.....	.....	
)	104,000	.0650	.0100	.....	.....	
)	105,920	.0967	.0317	.....	.....	Tensile strength.

General summary.

ıngth per square inch of original section	pounds..	105,920
t per square inch of original section	do...	52,000
per inch after rupture	inch..	0.1233
per inch under strain at elastic limit	do...	.001783
n diameter at point of rupture	do...	.104
n area after rupture, per centum of original section		33.5
rupture		1″.4 from middle of stem
f broken surface		granular, with dull silky center
of inch sections		″.11, ″.28*, ″.13, ″.08, ″.07, ″.07

No. 1021½.

Marks, $^{12\,R\,A_{11}}_{O_{12}}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remar
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000633	.000150	0.	.....	
6,250	25,000	.000783	.000150	0.	.....	
7,500	30,000	.000933	.000150	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.00125	.000150	0.	.....	
11,250	45,000	.001400	.000150	0.	.....	
11,500	46,000	.001433	.000033	.....	.....	
11,750	47,000	.001483	.000050	.....	.....	
12,000	48,000	.001517	.000034	.....	.....	
12,250	49,000	.001550	.000033	.....	.....	
12,500	50,000	.001617	.000067	.000033	.000033	
12,750	51,000	.001633	.000016	.....	.....	
13,000	52,000	.001700	.000067	.....	.....	
13,250	53,000	.001717	.000017	.....	.....	
13,500	54,000	.001767	.000050	.....	.....	
13,750	55,000	.001800	.000033	.000033	0.	
14,000	56,000	.001883	.000083	.....	.....	
14,250	57,000	.001933	.000050	.....	.....	
14,500	58,000	.002000	.000067	.....	.....	
14,750	59,000	.002033	.000033	.....	.....	Elastic limit.
15,000	60,000	.002283	.000250	.000300	.000267	
15,500	62,000	.002700	.000417	.....	.....	
16,000	64,000	.003333	.000633	.....	.....	
16,500	66,000	.004167	.000834	.....	.....	
17,000	68,000	.005000	.000833	.....	.....	
17,500	70,000	.006200	.001200	.....	.....	
18,000	72,000	.007667	.001467	.....	.....	
18,500	74,000	.009333	.001666	.....	.....	
19,000	76,000	.010833	.001500	.....	.....	
19,500	78,000	.012000	.001167	.....	.....	
20,000	80,000	.013800	.001800	.....	.....	
20,500	82,000	.015333	.001533	.....	.....	
21,000	84,000	.017500	.002167	.....	.....	
21,500	86,000	.019633	.002133	.....	.....	
22,000	88,000	.021333	.001700	.....	.....	
22,500	90,000	.023167	.001834	.....	.....	
23,000	92,000	.025667	.002500	.....	.....	
23,500	94,000	.027967	.002300	.....	.....	
24,000	96,000	.030333	.002366	.....	.....	
24,500	98,000	.033033	.002700	.....	.....	
25,000	100,000	.036333	.003300	.....	.....	
25,500	102,000	.0400	.003667	.....	.....	
26,000	104,000	.0450	.0050	.....	.....	
26,500	106,000	.0500	.0050	.....	.....	
27,000	108,000	.0567	.0067	.....	.....	
27,500	110,000	.0650	.0083	.....	.....	
28,000	112,000	.0883	.0233	.....	.....	Tensile stren

General summary.

Tensile strength per square inch of original section ..... pou
Elastic limit per square inch of original section ..... (
Elongation per inch after rupture ..... in
Elongation per inch under strain at elastic limit ..... (
Reduction in diameter at point of rupture ..... (
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ″.60 from n
Character of broken surface ..... granular at circumference
Elongation of inch sections ..... ″.07, ″.11, ″.24*,

No. 1022.

ıs, $\frac{12\ R\ A_{11}}{M_{12}}$

neter, ".564.

ional area, .25 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
L	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000150	.000150	0.	.....	
0	10,000	.000317	.000167	0.	.....	
0	15,000	.000467	.000150	0.	.....	
0	20,000	.000633	.000166	0.	.....	
0	25,000	.000767	.000134	0.	.....	
0	30,000	.000967	.000200	0.	.....	
0	35,000	.001117	.000150	0.	.....	
0	40,000	.001283	.000166	0.	.....	
0	41,000	.001300	.000017	.....	.....	
0	42,000	.001317	.000017	.....	.....	
0	43,000	.001333	.000016	.....	.....	
0	44,000	.001367	.000034	.....	.....	
0	45,000	.001400	.000033	0.	.....	
0	46,000	.001450	.000050	.....	.....	
0	47,000	.001483	.000033	.....	.....	
0	48,000	.001517	.000034	.....	.....	
0	49,000	.001550	.000033	.....	.....	
0	50,000	.001600	.000050	0.	.....	
0	51,000	.001633	.000033	.....	.....	
0	52,000	.001650	.000017	.....	.....	
0	53,000	.001700	.000050	.....	.....	
0	54,000	.001733	.000033	.....	.....	
0	55,000	.001783	.000050	.000017	.000017	
0	56,000	.001833	.000050	.....	.....	Elastic limit.
0	57,000	.002083	.000250	.....	.....	
0	58,000	.002900	.000817	.....	.....	
0	59,000	.003750	.000850	.....	.....	
0	60,000	.004283	.000533	.002133	.002116	
0	62,000	.005367	.001084	.....	.....	
0	64,000	.006717	.001350	.....	.....	
0	66,000	.008817	.001900	.....	.....	
0	68,000	.010000	.001383	.....	.....	
0	70,000	.011600	.001600	.....	.....	
0	72,000	.013300	.001700	.....	.....	
0	74,000	.015333	.002033	.....	.....	
0	76,000	.017083	.001750	.....	.....	
0	78,000	.018833	.001750	.....	.....	
0	80,000	.021417	.002584	.....	.....	
0	82,000	.023667	.002250	.....	.....	
0	84,000	.025917	.002250	.....	.....	
0	86,000	.028417	.002500	.....	.....	
0	88,000	.031250	.002833	.....	.....	
0	90,000	.034583	.003333	.....	.....	
0	92,000	.0383	.003717	.....	.....	
0	94,000	.0433	.0050	.....	.....	
0	96,000	.0483	.0050	.....	.....	
0	98,000	.0533	.0050	.....	.....	
0	100,000	.0617	.0084	.....	.....	
0	102,000	.0783	.0166	.....	.....	
	103,920	.1150	.0367	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds..	103,920
it per square inch of original section	do...	56,000
per inch after rupture	inch..	0.1383
per inch under strain at elastic limit	do...	.001833
in diameter at point of rupture	do...	.134
in area after rupture, per centum of original section		41.9
rupture		".85 from middle of stem
f broken surface		silky, with traces of granulation
of inch sections		".10, ".17, ".29*, ".12, ".08, ".07

12-INCH CAST-IRON B. L. RIFLE,

HOOPED AND TUBED WITH STEEL.

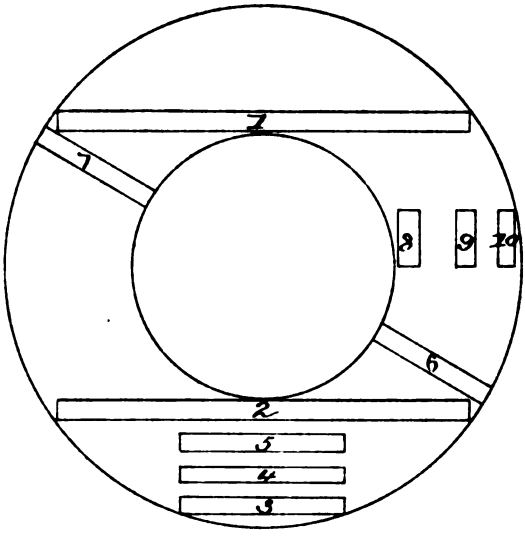
EXPERIMENTAL SECTION.

SPECIMENS FROM FIRST AND SECOND SLICE FROM CAST-IRON BODY, AND STEEL HOOPS AND TUBE.

12" Cast Iron B.L. Rifle, hooped and tubed with steel.

Cast iron body. Experimental section.

1st slice.



H Ex 31 492

I CAST-IRON B. L. RIFLE, HOOPED AND TUBED WITH STEEL. AFTER UNHOOPING.

No. 1119.

12″ H & T
s, C
No. 1
eter, ″.564.
onal area, .25 square inch.
th, 6″.

lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
2,000	.000050	.000050	0.	.....	
3,000	.000100	.000050	0.	.....	
4,000	.000133	.000033	0.	.....	
5,000	.000200	.000067	0.	.....	
6,000	.000233	.000033	0.	.....	
7,000	.000283	.000050	0.	.....	
8,000	.000333	.000050	0.	.....	
9,000	.000400	.000067	0.	.....	
10,000	.000433	.000033	0.	.....	
11,000	.000483	.000050	0.	.....	
12,000	.000517	.000034	0.	.....	
13,000	.000567	.000050	.000017	.000017	
14,000	.000683	.000016	.000050	.000033	
15,000	.000717	.000034	.000050	0.	
16,000	.000783	.000066	.000067	.000017	
17,000	.000850	.000067	.000083	.000016	
18,000	.000950	.000100	.000117	.000034	
19,000	.001033	.000083	.000150	.000033	
20,000	.001150	.000117	.000200	.000050	
21,000	.001250	.000100	.000250	.000050	
22,000	.001450	.000200	.000383	.000133	
23,000	.001683	.000233	.000533	.000150	
24,000	.002000	.000317	.000750	.000217	
25,000	.002283	.000283	.000967	.000217	
26,000	.002700	.000417	.001283	.000316	
29,000	.....	.....	.....	.....	Tensile strength.

tured $1\frac{3}{4}$″ from neck. Character of broken surface, uniform ation.

No. 1120.

Marks, 12″ H & T C No. 1
Diameter, ″.564.
Sectional area, .25 square inch.
Length 6″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remark
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000050	.000050	0.	.....	
750	3,000	.000083	.000033	0.	.....	
1,000	4,000	.000133	.000050	0.	.....	
1,250	5,000	.000183	.000050	0.	.....	
1,500	6,000	.000233	.000050	0.	.....	
1,750	7,000	.000267	.000034	0.	.....	
2,000	8,000	.000350	.000083	0.	.....	
2,250	9,000	.000417	.000067	0.	.....	
2,500	10,000	.000467	.000050	0.	.....	
2,750	11,000	.000517	.000050	0.	.....	
3,000	12,000	.000600	.000083	.000033	.000033	
3,250	13,000	.000633	.000033	.000033	0.	
3,500	14,000	.000717	.000084	.000067	.000034	
3,750	15,000	.000783	.000066	.000083	.000016	
4,000	16,000	.000883	.000100	.000117	.000034	
4,250	17,000	.000967	.000084	.000150	.000033	
4,500	18,000	.001117	.000150	.000200	.000050	
4,750	19,000	.001183	.000066	.000233	.000033	
5,000	20,000	.001283	.000100	.000283	.000050	
5,250	21,000	.001433	.000150	.000367	.000084	
5,500	22,000	.001633	.000200	.000467	.000100	
5,750	23,000	.001767	.000134	.000617	.000150	
6,000	24,000	.002000	.000233	.000683	.000066	
6,250	25,000	.002467	.000467	.001050	.000367	
6,500	26,000	.002817	.000350	.001333	.000283	
6,690	26,760	.....	.....	.....	.....	Tensile stren

Fractured 1″.8 from neck.
Character of broken surface, uniform granulation.

No. 1121.

'ks, 12" H & T C No. 2
meter, ".564.
tional area, .25 square inch.
gth 6".

pplied loads. tal.	Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
nds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000100	.000100	0.	.....	
750	3,000	.000167	.000067	0.	.....	
000	4,000	.000217	.000050	0.	.....	
250	5,000	.000250	.000033	0.	.....	
500	6,000	.000300	.000050	0.	.....	
750	7,000	.000350	.000050	0.	.....	
000	8,000	.000400	.000050	0.	.....	
250	9,000	.000433	.000033	.000033	.000033	
500	10,000	.000500	.000067	.000067	.000034	
750	11,000	.000550	.000050	.000067	0.	
000	12,000	.000600	.000050	.000083	.000016	
250	13,000	.000667	.000067	.000083	0.	
500	14,000	.000733	.000066	.000100	.000017	
750	15,000	.000800	.000067	.000100	0.	
000	16,000	.000883	.000083	.000133	.000033	
250	17,000	.000933	.000050	.000150	.000017	
500	18,000	.001050	.000117	.000183	.000033	
750	19,000	.001133	.000083	.000250	.000067	
000	20,000	.001283	.000150	.000317	.000067	
250	21,000	.001400	.000117	.000383	.000066	
500	22,000	.001550	.000150	.000467	.000084	
750	23,000	.001767	.000217	.000583	.000116	
000	24,000	.002033	.000266	.000783	.000200	
250	25,000	.002417	.000384	.001067	.000284	
80	28,720	.....	.....	.....	.....	Tensile strength.

'ractured at middle of stem.
haracter of broken surface, uniform granulation.

No. 1122.

Marks, 12″ H & T C No. 2
Diameter, ″.564.
Sectional area, .25 square inch.
Length, 6″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000050	.000050	0.	.....	
750	3,000	.000083	.000033	0.	.....	
1,000	4,000	.000133	.000050	0.	.....	
1,250	5,000	.000183	.000050	0	.....	
1,500	6,000	.000233	.000050	0.	.....	
1,750	7,000	.000267	.000034	0.	.....	
2,000	8,000	.000350	.000083	0.	.....	
2,250	9,000	.000417	.000067	.000017	.000017	
2,500	10,000	.000467	.000050	.000017	0.	
2,750	11,000	.000517	.000050	.000033	.000016	
3,000	12,000	.000550	.000033	.000033	0.	
3,250	13,000	.000617	.000067	.000050	.000017	
3,500	14,000	.000667	.000050	.000067	.000017	
3,750	15,000	.000717	.000050	.000083	.000016	
4,000	16,000	.000817	.000100	.000100	.000017	
4,250	17,000	.000933	.000116	.000133	.000033	
4,500	18,000	.001000	.000067	.000167	.000034	
4,750	19,000	.001067	.000067	.000200	.000033	
5,000	20,000	.001267	.000200	.000283	.000083	
5,250	21,000	.001367	.000100	.000350	.000067	
5,500	22,000	.001567	.000200	.000467	.000117	
5,750	23,000	.001700	.000133	.000567	.000100	
6,000	24,000	.002067	.000367	.000800	.000233	
6,250	25,000	.002300	.000233	.001017	.000217	
7,190	28,760	.....	.....	.....	.....	Tensile strength

Fractured 1 inch from neck.
Character of broken surface, uniform granulation.

No. 544.

arks, 12″ H & T C No. 3
ngth, 12″.
iameter, 1″.129.
ctional area, 1 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
otal.	Per square inch.					
unds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000070	.000070	0.	.....	
3,000	3,000	.000120	.000050	.000010	.000010	
4,000	4,000	.000170	.000050	.000010	0.	
5,000	5,000	.000220	.000050	.000010	0.	
6,000	6,000	.000260	.000040	.000010	0.	
7,000	7,000	.000290	.000030	.000010	0.	
8,000	8,000	.000330	.000040	.000010	0.	
9,000	9,000	.000380	.000050	.000010	0.	
10,000	10,000	.000430	.000050	.000020	.000010	
11,000	11,000	.000480	.000050	.000020	0.	
12,000	12,000	.000530	.000050	.000030	.000010	
13,000	13,000	.000580	.000050	.000040	.000010	
14,000	14,000	.000630	.000050	.000050	.000010	
15,000	15,000	.000680	.000050	.000060	.000010	
16,000	16,000	.000730	.000050	.000070	.000010	
17,000	17,000	.000780	.000050	.000070	0.	
18,000	18,000	.000850	.000070	.000080	.000010	
19,000	19,000	.000900	.000050	.000080	0.	
20,000	20,000	.000980	.000080	.000100	.000020	
21,000	21,000	.001030	.000050	.000110	.000010	
22,000	22,000	.001090	.000060	.000120	.000010	
23,000	23,000	.001170	.000080	.000140	.000020	
24,000	24,000	.001240	.000070	.000180	.000040	
25,000	25,000	.001320	.000080	.000210	.000030	
26,000	26,000	.001440	.000120	.000260	.000050	
27,000	27,000	.001560	.000120	.000300	.000040	
28,000	28,000	.001680	.000120	.000390	.000090	
29,000	29,000	.001820	.000140	.000480	.000090	
30,000	30,000	.001970	.000150	.000590	.000110	
31,000	31,000	.002240	.000270	.000790	.000200	
32,000	32,000	.002470	.000230	.000960	.000170	
33,000	33,000	.002770	.000300	.001220	.000260	
34,000	34,000	.003150	.000380	.001570	.000350	
35,000	35,000	.003620	.000470	.001960	.000290	
36,000	36,000	.003910	.000290	.002250	.000290	
37,000	37,000	.004290	.000380	.002570	.000320	
38,000	38,000	.004860	.000570	.003020	.000450	
39,000	39,000	.005310	.000450	.003440	.000420	
40,000	40,000	.005920	.000610	.003990	.000550	
51,450	51,450	.....	.....	.....	.....	Ultimate strength.

anner of failure, triple flexure.

No. 545.

Marks, 12″ H & T C No. 4
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	0.	.....	
3,000	3,000	.000100	.000040	0.	.....	
4,000	4,000	.000140	.000040	0.	.....	
5,000	5,000	.000180	.000040	0.	.....	
6,000	6,000	.000220	.000040	0.	.....	
7,000	7,000	.000270	.000050	0.	.....	
8,000	8,000	.000320	.000050	0.	.....	
9,000	9,000	.000370	.000050	0.	.....	
10,000	10,000	.000420	.000050	0.	.....	
11,000	11,000	.000460	.000040	0.	.....	
12,000	12,000	.000510	.000050	.000010	.000010	
13,000	13,000	.000560	.000050	.000010	0.	
14,000	14,000	.000610	.000050	.000010	0.	
15,000	15,000	.000660	.000050	.000020	.000010	
16,000	16,000	.000710	.000050	.000030	.000010	
17,000	17,000	.000760	.000050	.000030	0.	
18,000	18,000	.000810	.000050	.000040	.000010	
19,000	19,000	.000870	.000060	.000050	.000010	
20,000	20,000	.000930	.000060	.000070	.000020	
21,000	21,000	.001000	.000070	.000090	.000020	
22,000	22,000	.001070	.000070	.000100	.000010	
23,000	23,000	.001140	.000070	.000130	.000030	
24,000	24,000	.001230	.000090	.000160	.000030	
25,000	25,000	.001320	.000090	.000200	.000040	
26,000	26,000	.001420	.000100	.000240	.000040	
27,000	27,000	.001520	.000100	.000300	.000060	
28,000	28,000	.001640	.000120	.000370	.000070	
29,000	29,000	.001780	.000140	.000490	.000120	
30,000	30,000	.001970	.000190	.000610	.000120	
31,000	31,000	.002220	.000250	.000770	.000160	
32,000	32,000	.002460	.000240	.000970	.000200	
33,000	33,000	.002770	.000310	.001230	.000260	
34,000	34,000	.003110	.000340	.001520	.000290	
35,000	35,000	.003520	.000410	.001880	.000360	
36,000	36,000	.003970	.000450	.002270	.000390	
37,000	37,000	.004420	.000450	.002680	.000410	
38,000	38,000	.005020	.000600	.003210	.000530	
39,000	39,000	.005580	.000560	.003680	.000470	
40,000	40,000	.006380	.000800	.004420	.000740	
49,900	49,900	.....	.....	.....	.....	Ultimate streng

Manner of failure, triple flexure.

No. 546.

Marks, 12" H & T / C / No. 5

Length 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	0.	.....	
3,000	3,000	.000110	.000050	0.	.....	
4,000	4,000	.000140	.000030	0.	.....	
5,000	5,000	.000190	.000050	0.	.....	
6,000	6,000	.000220	.000030	0.	.....	
7,000	7,000	.000270	.000050	0.	.....	
8,000	8,000	.000320	.000050	0.	.....	
9,000	9,000	.000370	.000050	0.	.....	
10,000	10,000	.000420	.000050	.000010	.000010	
11,000	11,000	.000470	.000050	.000010	0.	
12,000	12,000	.000520	.000050	.000010	0.	
13,000	13,000	.000570	.000050	.000010	0.	
14,000	14,000	.000620	.000050	.000020	.000010	
15,000	15,000	.000670	.000050	.000020	0.	
16,000	16,000	.000720	.000050	.000030	.000010	
17,000	17,000	.000770	.000050	.000030	0.	
18,000	18,000	.000820	.000050	.000040	.000010	
19,000	19,000	.000870	.000050	.000060	.000020	
20,000	20,000	.000930	.000060	.000070	.000010	
21,000	21,000	.001010	.000080	.000080	.000010	
22,000	22,000	.001070	.000060	.000090	.000010	
23,000	23,000	.001130	.000060	.000100	.000010	
24,000	24,000	.001190	.000060	.000140	.000040	
25,000	25,000	.001300	.000110	.000170	.000030	
26,000	26,000	.001400	.000100	.000220	.000050	
27,000	27,000	.001480	.000080	.000270	.000050	
28,000	28,000	.001570	.000090	.000320	.000050	
29,000	29,000	.001730	.000160	.000430	.000110	
30,000	30,000	.001890	.000160	.000540	.000110	
31,000	31,000	.002100	.000210	.000700	.000160	
32,000	32,000	.002370	.000270	.000910	.000210	
33,000	33,000	.002670	.000300	.001150	.000240	
34,000	34,000	.003030	.000360	.001470	.000320	
35,000	35,000	.003420	.000390	.001890	.000420	
36,000	36,000	.003820	.000400	.002160	.000270	
37,000	37,000	.004210	.000390	.002510	.000350	
38,000	38,000	.004790	.000580	.003020	.000510	
39,000	39,000	.005280	.000490	.003450	.000430	
40,000	40,000	.005800	.000520	.003880	.000430	
51,100	51,100	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 547.

Marks, 12″ H & T C No. 6
Length, 9″.
Diameter, 1″.129.
Sectional area, 1 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000067	.000067	0.	.....	
3,000	3,000	.000117	.000050	0.	.....	
4,000	4,000	.000167	.000050	.000017	.000017	
5,000	5,000	.000217	.000050	.000017	0.	
6,000	6,000	.000267	.000050	.000033	.000016	
7,000	7,000	.000317	.000050	.000033	0.	
8,000	8,000	.000350	.000033	.000033	0.	
9,000	9,000	.000383	.000033	.000033	0.	
10,000	10,000	.000433	.000050	.000050	.000017	
11,000	11,000	.000467	.000034	.000050	0.	
12,000	12,000	.000533	.000066	.000050	0.	
13,000	13,000	.000567	.000034	.000050	0.	
14,000	14,000	.000617	.000050	.000067	.000017	
15,000	15,000	.000683	.000066	.000067	0.	
16,000	16,000	.000733	.000050	.000083	.000016	
17,000	17,000	.000783	.000050	.000083	0.	
18,000	18,000	.000867	.000084	.000100	.000017	
19,000	19,000	.000900	.000033	.000100	0.	
20,000	20,000	.000967	.000067	.000117	.000017	
21,000	21,000	.001050	.000083	.000133	.000016	
22,000	22,000	.001117	.000067	.000150	.000017	
23,000	23,000	.001167	.000050	.000150	0.	
24,000	24,000	.001250	.000083	.000183	.000033	
25,000	25,000	.001350	.000100	.000250	.000067	
26,000	26,000	.001467	.000117	.000300	.000050	
27,000	27,000	.001583	.000116	.000350	.000050	
28,000	28,000	.001700	.000117	.000417	.000067	
29,000	29,000	.001883	.000183	.000550	.000133	
30,000	30,000	.002050	.000167	.000667	.000117	
31,000	31,000	.002267	.000217	.000833	.000166	
32,000	32,000	.002550	.000283	.001083	.000250	
33,000	33,000	.002883	.000333	.001350	.000267	
34,000	34,000	.003217	.000334	.001650	.000300	
35,000	35,000	.003667	.000450	.002050	.000400	
36,000	36,000	.004017	.000350	.002333	.000283	
37,000	37,000	.004650	.000633	.002933	.000600	
38,000	38,000	.005133	.000483	.003383	.000450	
39,000	39,000	.005667	.000534	.003867	.000484	
40,000	40,000	.006217	.000550	.004350	.000483	
64,300	64,300	.....	.....	.....	.....	Ultimate stren;

Manner of failure, triple flexure.

No. 548.

ks, 12″ H & T C No. 7
gth, 9″.
meter, 1″.129.
ional area, 1 square inch.

plied loads.	Per square inch.	Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
ls.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	2,000	.000067	.000067	0.	.....	
0	3,000	.000117	.000050	0.	.....	
0	4,000	.000167	.000050	.000017	.000017	
0	5,000	.000200	.000033	.000017	0.	
0	6,000	.000250	.000050	.000033	.000016	
0	7,000	.000300	.000050	.000050	.000017	
0	8,000	.000350	.000050	.000050	0.	
0	9,000	.000400	.000050	.000050	0.	
0	10,000	.000450	.000050	.000067	.000017	
0	11,000	.000483	.000033	.000067	0.	
0	12,000	.000533	.000050	.000083	.000016	
0	13,000	.000600	.000067	.000100	.000017	
0	14,000	.000650	.000050	.000100	0.	
0	15,000	.000683	.000033	.000100	0.	
0	16,000	.000767	.000084	.000117	.000017	
0	17,000	.000833	.000066	.000117	0.	
0	18,000	.000883	.000050	.000133	.000016	
0	19,000	.000933	.000050	.000133	0.	
0	20,000	.001000	.000067	.000150	.000017	
0	21,000	.001050	.000050	.000167	.000017	
0	22,000	.001117	.000067	.000200	.000033	
0	23,000	.001183	.000066	.000217	.000017	
0	24,000	.001267	.000084	.000250	.000033	
0	25,000	.001367	.000100	.000283	.000033	
0	26,000	.001433	.000066	.000317	.000034	
0	27,000	.001533	.000100	.000350	.000033	
0	28,000	.001700	.000167	.000450	.000100	
0	29,000	.001817	.000117	.000550	.000100	
0	30,000	.002000	.000183	.000683	.000133	
0	31,000	.002250	.000250	.000867	.000184	
0	32,000	.002533	.000283	.001083	.000216	
0	33,000	.002783	.000250	.001283	.000200	
0	34,000	.003200	.000417	.001650	.000367	
0	35,000	.003550	.000350	.001950	.000300	
0	36,000	.004033	.000483	.002367	.000417	
0	37,000	.004533	.000500	.002800	.000433	
	38,000	.005017	.000484	.003267	.000467	
	39,000	.005533	.000516	.003750	.000483	
	40,000	.005983	.000450	.004200	.000150	
	66,900	.....	.....	.....	.....	Ultimate strength.

ner of failure, triple flexure.

TENACITY SPECIMENS.

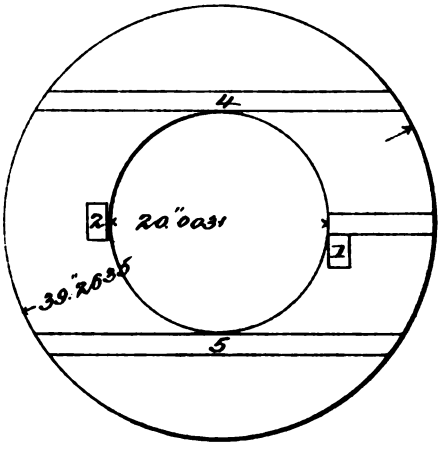
Marks, $\cdot 12'' \frac{H}{C} \& T$

No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fractu
				Total.	Pounds.	
		Inches.	*Sq. inch.*	*Pounds.*	*Per sq. inch.*	
1117	9	.564	.25	7,440	29,760	Uniform granulation
1118	10	.564	.25	8,600	34,400	Do.

12" Cast Iron B. L. Rifle. hooped and tubed with steel.

Cast iron body. Experimental section.

2nd Slice



H Ex 31 492

TENACITY SPECIMENS.

rks, 12″ H & T C

Test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Pounds.	
		Inches.	*Sq. inch.*	*Pounds.*	*Per sq. inch.*	
272	1	1.129	1.00	29,800	29,800	Granular, mottled.
273	2	1.129	1.00	29,550	29,550	Do.

No. 2270.

Marks, 12″ H & T C 4

Diameter, 1″.129.

Sectional area, 1 square inch.

Length, 25″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000052	.000052	0.	.....	
3,000	3,000	.000100	.000048	0.	.....	
4,000	4,000	.000148	.000048	.000008	.000008	
5,000	5,000	.000200	.000052	.000008	0.	
6,000	6,000	.000252	.000052	.000012	.000004	
7,000	7,000	.000304	.000052	.000020	.000008	
8,000	8,000	.000356	.000052	.000028	.000008	
9,000	9,000	.000416	.000060	.000036	.000008	
10,000	10,000	.000472	.000056	.000044	.000008	
11,000	11,000	.000536	.000064	.000056	.000012	
12,000	12,000	.000600	.000064	.000068	.000012	
13,000	13,000	.000668	.000068	.000084	.000016	
14,000	14,000	.000770	.000102	.000100	.000016	
15,000	15,000	.000820	.000050	.000128	.000028	
16,000	16,000	.000904	.000084	.000156	.000028	
17,000	17,000	.000996	.000092	.000184	.000028	
18,000	18,000	.001116	.000120	.000240	.000056	
19,000	19,000	.001244	.000128	.000300	.000060	
20,000	20,000	.001380	.000136	.000372	.000072	
24,880	24,880	.....	.....	.....	.....	Tensile strengt

Fractured at neck of specimen.

Character of broken surface, granular, mottled.

No. 2271.

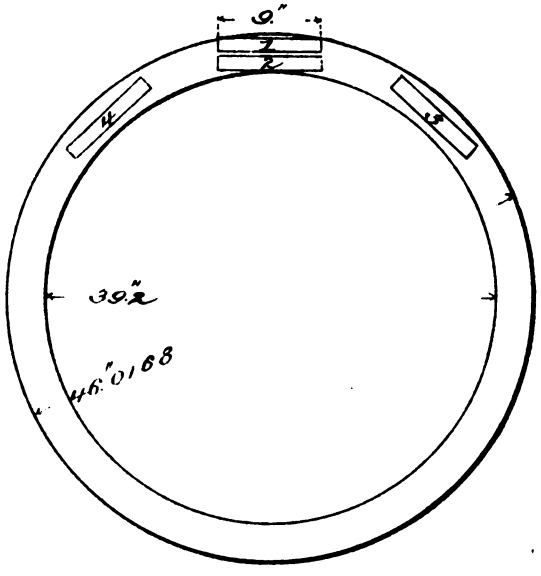
12″ H & T
s, C
5
eter, 1″.129.
nal area, 1 square inch.
h, 25″.

ied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
2,000	.000052	.000052	0.	.....	
3,000	.000092	.000040	0.	.....	
4,000	.000144	.000052	0.	.....	
5,000	.000188	.000044	0.	.....	
6,000	.000236	.000048	.000004	.000004	
7,000	.000284	.000048	.000008	.000004	
8,000	.000340	.000056	.000016	.000008	
9,000	.000396	.000056	.000024	.000008	
10,000	.000452	.000056	.000032	.000008	
11,000	.000508	.000056	.000040	.000008	
12,000	.000580	.000072	.000048	.000008	
13,000	.000644	.000064	.000064	.000016	
14,000	.000708	.000064	.000080	.000016	
15,000	.000792	.000084	.000104	.000024	
16,000	.000880	.000088	.000132	.000028	
17,000	.000968	.000088	.000160	.000028	
18,000	.001076	.000108	.000212	.000052	
19,000	.001204	.000128	.000272	.000060	
20,000	.001340	.000136	.000356	.000084	
27,450	.....	.....	.....	.....	Tensile strength.

tured 6″ from neck.
acter of broken surface, granular, mottled.

12" Cast Iron B.L. Rifle, hooped an tubed with steel.

Hoop Ax, experimental cylinder



H Ex 31 49 2

No. 1013.

12" H T
3, H
No. 1
eter, ".564.
nal area, .25 square inch.

lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000083	.000083	0.	.....	
10,000	.000267	.000184	0.	.....	
15,000	.000383	.000066	0.	.....	
20,000	.000583	.000200	0.	.....	
25,000	.000700	.000117	0.	.....	
30,000	.000883	.000183	0.	.....	
35,000	.001000	.000117	0.	.....	
40,000	.001183	.000183	0.	.....	
41,000	.001217	.000034	.....	.....	
42,000	.001250	.000033	.....	.....	
43,000	.001283	.000033	.....	.....	
44,000	.001317	.000034	.....	.....	
45,000	.001350	.000033	0.	.....	
46,000	.001383	.000033	.....	.....	
47,000	.001417	.000034	.....	.....	
48,000	.001467	.000050	.....	.....	
49,000	.001500	.000033	.....	.....	
50,000	.001550	.000050	.....	.....	
51,000	.001567	.000017	.....	.....	
52,000	.001600	.000033	.....	.....	
53,000	.001650	.000050	.....	.....	Elastic limit.
54,000	.001733	.000083	.....	.....	
55,000	.001817	.000084	.000100	.000100	
56,000	.002150	.000333	.....	.....	
57,000	.002417	.000267	.....	.....	
58,000	.002667	.000250	.....	.....	
59,000	.002967	.000300	.....	.....	
60,000	.003483	.000516	.001417	.001317	
62,000	.004500	.001017	.....	.....	
64,000	.006167	.001667	.....	.....	
66,000	.007750	.001583	.....	.....	
68,000	.009333	.001583	.....	.....	
70,000	.011300	.001967	.....	.....	
72,000	.012750	.001450	.....	.....	
74,000	.014583	.001833	.....	.....	
76,000	.016583	.002000	.....	.....	
78,000	.018333	.001750	.....	.....	
80,000	.020833	.002500	.....	.....	
82,000	.022917	.002084	.....	.....	
84,000	.025000	.002083	.....	.....	
86,000	.027833	.002833	.....	.....	
88,000	.030467	.002634	.....	.....	
90,000	.0333	.002833	.....	.....	
92,000	.0367	.0034	.....	.....	
94,000	.0417	.0050	.....	.....	
96,000	.0467	.0050	.....	.....	
98,000	.0533	.0066	.....	.....	
100,000	.0617	.0084	.....	.....	
102,000	.0750	.0133	.....	.....	
103,240	.1067	.0317	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	103,240
per square inch of original section	do...	53,000
er inch after rupture	inch..	0.1367
er inch under strain at elastic limit	do...	.001650
diameter at point of rupture	do...	.124
area after rupture, per centum of original section		39.2
upture		½ inch from middle of stem
broken surface		granular at circumference; silky center
inch sections		".09, ".12, ".28, ".13, ".11, ".09

No. 1014.

Marks, 12″ II T / A / No. 2

Diameter, ″.564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Rem
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000300	.000183	0.	.....	
3,750	15,000	.000417	.000117	0.	.....	
5,000	20,000	.000583	.000166	0.	.....	
6,250	25,000	.000733	.000150	0.	.....	
7,500	30,000	.000917	.000184	0.	.....	
8,750	35,000	.001083	.000166	0.	.....	
10,000	40,000	.001250	.000167	0.	.....	
10,250	41,000	.001267	.000017	.....	.....	
10,500	42,000	.001283	.000016	.....	.....	
10,750	43,000	.001317	.000034	.....	.....	
11,000	44,000	.001367	.000050	.....	.....	
11,250	45,000	.001400	.000033	.000017	.000017	
11,500	46,000	.001417	.000017	.....	.....	
11,750	47,000	.001450	.000033	.....	.....	
12,000	48,000	.001500	.000050	.....	.....	
12,250	49,000	.001550	.000050	.....	.....	
12,500	50,000	.001600	.000050	.000033	.000016	
12,750	51,000	.001650	.000050	.....	.....	
13,000	52,000	.001700	.000050	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	Elastic lim
13,500	54,000	.001800	.000067	.....	.....	
13,750	55,000	.001967	.000167	.000217	.000184	
14,000	56,000	.002250	.000283	.....	.....	
14,250	57,000	.002467	.000217	.....	.....	
14,500	58,000	.002800	.000333	.....	.....	
14,750	59,000	.003167	.000367	.....	.....	
15,000	60,000	.003517	.000350	.001617	.001400	
15,500	62,000	.004917	.001400	.....	.....	
16,000	64,000	.006083	.001166	.....	.....	
16,500	66,000	.007833	.001750	.....	.....	
17,000	68,000	.009500	.001667	.....	.....	
17,500	70,000	.011167	.001667	.....	.....	
18,000	72,000	.013083	.001916	.....	.....	
18,500	74,000	.014667	.001584	.....	.....	
19,000	76,000	.016500	.001833	.....	.....	
19,500	78,000	.018333	.001833	.....	.....	
20,000	80,000	.020333	.002000	.....	.....	
20,500	82,000	.022500	.002167	.....	.....	
21,000	84,000	.024833	.002333	.....	.....	
21,500	86,000	.027500	.002667	.....	.....	
22,000	88,000	.030133	.002633	.....	.....	
22,500	90,000	.033000	.002867	.....	.....	
23,000	92,000	.0350	.0020	.....	.....	
23,500	94,000	.0400	.0050	.....	.....	
24,000	96,000	.0450	.0050	.....	.....	
24,500	98,000	.0500	.0050	.....	.....	
25,000	100,000	.0583	.0083	.....	.....	
25,500	102,000	.0667	.0084	.....	.....	
26,000	104,000	.0850	.0183	.....	.....	
26,270	105,080	.1200	.0350	.....	.....	Tensile st

General summary.

Specific gravity.....

Hardness.....

Tensile strength per square inch of original section.....

Elastic limit per square inch of original section.....

Elongation per inch after rupture.....

Elongation per inch under strain at elastic limit.....

Reduction in diameter at point of rupture.....

Reduction in area after rupture, per centum of original section.....

Position of rupture.....

Character of broken surface.....granular at circumfere

Elongation of inch sections.....″.25′, ″.19, ″

No. 1015.

.12" H T
is, A
No. 3
meter, ".564.
ional area, .25 square inch.

plied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000117	.000117	0.	.....	
10,000	.000283	.000166	0.	.....	
15,000	.000450	.000167	0.	.....	
20,000	.000583	.000133	0.	.....	
25,000	.000750	.000167	0.	.....	
30,000	.000917	.000167	0.	.....	
35,000	.001067	.000150	0.	.....	
40,000	.001233	.000166	0.	.....	
45,000	.001367	.000134	.....	.....	
46,000	.001383	.000016	.....	.....	
47,000	.001433	.000050	.....	.....	
48,000	.001483	.000050	.....	.....	
49,000	.001517	.000034	.....	.....	
50,000	.001567	.000050	0.	.....	
51,000	.001617	.000050	.....	.....	
52,000	.001667	.000050	.....	.....	
53,000	.001717	.000050	.....	.....	Elastic limit.
54,000	.001867	.000150	.....	.....	
55,000	.002017	.000150	.000217	.000217	
56,000	.002250	.000233	.....	.....	
57,000	.002433	.000183	.....	.....	
58,000	.002700	.000267	.....	.....	
59,000	.002983	.000283	.....	.....	
60,000	.003467	.000484	.001367	.001150	
62,000	.004300	.000833	.....	.....	
64,000	.006167	.001867	.....	.....	
66,000	.007667	.001500	.....	.....	
68,000	.009033	.001366	.....	.....	
70,000	.010667	.001634	.....	.....	
72,000	.012667	.002000	.....	.....	
74,000	.014167	.001500	.....	.....	
76,000	.016033	.001866	.....	.....	
78,000	.017917	.001884	.....	.....	
80,000	.020083	.002166	.....	.....	
82,000	.022167	.002084	.....	.....	
84,000	.024417	.002250	.....	.....	
86,000	.026917	.002500	.....	.....	
88,000	.029500	.002583	.....	.....	
90,000	.032250	.002750	.....	.....	
92,000	.036000	.003750	.....	.....	
94,000	.0383	.0023	.....	.....	
96,000	.0433	.0050	.....	.....	
98,000	.0483	.0050	.....	.....	
100,000	.0533	.0050	.....	.....	
102,000	.0617	.0084	.....	.....	
104,000	.0800	.0183	.....	.....	
105,280	.1133	.0333	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	105,280
per square inch of original section	do...	53,000
er inch after rupture	inch..	0.1467
er inch under strain at elastic limit	do...	.001717
diameter at point of rupture	do...	.114
area after rupture, per centum of original section		36.4
upture		2".10 from neck
broken surface	granular at circumference; silky center	
inch sections		".11, ".29, ".17, ".11, ".11, ".09

Ex. 31——71

No. 1016.

Marks, 12" H T / A / No. 4

Diameter, ".564.

Sectional area, .25 square inch.

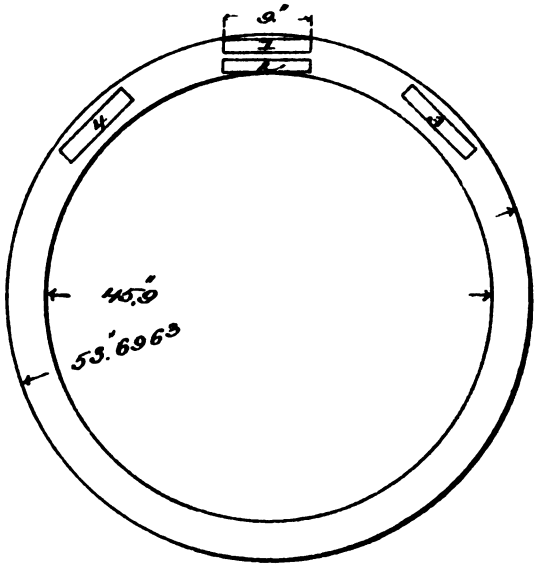
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Rema
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000450	.000133	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000933	.000150	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	0.	.....	
11,250	45,000	.001400	.000133	0.	.....	
12,500	50,000	.001600	.000200	.000033	.000033	
12,750	51,000	.001650	.000050	.....	.....	
13,000	52,000	.001717	.000067	.....	.....	
13,250	53,000	.001783	.000066	.....	.....	Elastic limit
13,500	54,000	.001883	.000100	.....	.....	
13,750	55,000	.002017	.000134	.000217	.000184	
14,000	56,000	.002200	.000183	.....	.....	
14,250	57,000	.002383	.000183	.....	.....	
14,500	58,000	.002667	.000284	.....	.....	
14,750	59,000	.002917	.000250	.....	.....	
15,000	60,000	.003333	.000416	.001250	.001033	
15,500	62,000	.004167	.000834	.....	.....	
16,000	64,000	.005700	.001533	.....	.....	
16,500	66,000	.007100	.001400	.....	.....	
17,000	68,000	.008917	.001817	.....	.....	
17,500	70,000	.010600	.001683	.....	.....	
18,000	72,000	.012250	.001650	.....	.....	
18,500	74,000	.014000	.001750	.....	.....	
19,000	76,000	.015750	.001750	.....	.....	
19,500	78,000	.017750	.002000	.....	.....	
20,000	80,000	.019917	.002167	.....	.....	
20,500	82,000	.022033	.002116	.....	.....	
21,000	84,000	.024333	.002300	.....	.....	
21,500	86,000	.026917	.002584	.....	.....	
22,000	88,000	.029467	.002550	.....	.....	
22,500	90,000	.032500	.003033	.....	.....	
23,000	92,000	.0350	.0025	.....	.....	
23,500	94,000	.0383	.0033	.....	.....	
24,000	96,000	.0423	.0050	.....	.....	
24,500	98,000	.0483	.0050	.....	.....	
25,000	100,000	.0550	.0067	.....	.....	
25,500	102,000	.0650	.0100	.....	.....	
26,000	104,000	.0817	.0167	.....	.....	
26,170	104,680	.1033	.0216	.....	.....	Tensile stre

General summary.

Tensile strength per square inch of original section ..... pou
Elastic limit per square inch of original section .....
Elongation per inch after rupture i
Elongation per inch under strain at elastic limit .....
Reduction in diameter at point of rupture .....
Reduction in area after rupture, per centum of original section .....
Position of rupture .....
Character of broken surface .....
Elongation of inch sections ..... ".19*, ".23, ".12,

12" Cast Iron B.L. Rifle, hooped and tubed with steel.

Hoop Bx Experimental section



H Ex 3.1 49 2

No. 1017.

3, 12″ H T
B
No. 1
eter, ″.564.
nal area, .25 square inch.

ied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000167	.000167	0.	.....	
10,000	.000300	.000133	0.	.....	
15,000	.000467	.000167	0.	.....	
20,000	.000633	.000166	.000017	.000017	
25,000	.000783	.000150	.000017	0.	
30,000	.000933	.000150	.000017	0.	
35,000	.001100	.000167	.000017	0.	
40,000	.001283	.000183	.000017	0.	
41,000	.001317	.000034	.....	.....	
42,000	.001333	.000016	.....	.....	
43,000	.001367	.000034	.....	.....	
44,000	.001383	.000016	.....	.....	
45,000	.001433	.000050	.000017	0.	
46,000	.001467	.000034	.....	.....	
47,000	.001500	.000033	.....	.....	
48,000	.001550	.000050	.....	.....	
49,000	.001583	.000033	.....	.....	
50,000	.001617	.000034	.000017	.000034	
51,000	.001650	.000033	.....	.....	
52,000	.001683	.000033	.....	.....	Elastic limit.
53,000	.001767	.000084	.....	.....	
54,000	.001850	.000083	.....	.....	
55,000	.001933	.000083	.000133	.000116	
56,000	.002383	.000450	.....	.....	
57,000	.002817	.000434	.....	.....	
58,000	.003717	.000900	.....	.....	
59,000	.004333	.000616	.....	.....	
60,000	.004933	.000600	.002717	.002584	
62,000	.005783	.000850	.....	.....	
64,000	.007833	.002050	.....	.....	
66,000	.009750	.001917	.....	.....	
68,000	.011300	.001550	.....	.....	
70,000	.012750	.001450	.....	.....	
72,000	.014667	.001917	.....	.....	
74,000	.016167	.001500	.....	.....	
76,000	.018167	.002000	.....	.....	
78,000	.020133	.001966	.....	.....	
80,000	.022333	.002200	.....	.....	
82,000	.024350	.002017	.....	.....	
84,000	.026800	.002450	.....	.....	
86,000	.029500	.002700	.....	.....	
88,000	.032517	.003017	.....	.....	
90,000	.035600	.003083	.....	.....	
92,000	.0383	.0027	.....	.....	
94,000	.0433	.0050	.....	.....	
96,000	.0483	.0050	.....	.....	
98,000	.0533	.0050	.....	.....	
100,000	.0633	.0100	.....	.....	
102,000	.0800	.0167	.....	.....	
103,520	.1233	.0433	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	103,520
per square inch of original section	do...	52,000
er inch after rupture	inch..	0.1433
er inch under strain at elastic limit	do...	.001683
diameter at point of rupture	do...	.124
area after rupture, per centum of original section		39.2
upture		″.70 from middle of stem
broken surface	silky; with ring of granular mteal near circumference	
inch sections		″.10, ″.13, ″.32[4], ″.12, ″.11, ″.08

No. 1018.

Marks, 12″ H & T B No. 2

Diameter, ″.564.

Sectional area, .25 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000433	.000116	0.	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001117	.000184	0.	.....	
10,000	40,000	.001250	.000133	0.	.....	
10,250	41,000	.001283	.000033	.....	.....	
10,500	42,000	.001317	.000034	.....	.....	
10,750	43,000	.001350	.000033	.....	.....	
11,000	44,000	.001400	.000050	.....	.....	
11,250	45,000	.001450	.000050	.0	.....	
11,500	46,000	.001500	.000050	.....	.....	
11,750	47,000	.001517	.000017	.....	.....	
12,000	48,000	.001550	.000033	.....	.....	
12,250	49,000	.001583	.000033	.....	.....	
12,500	50,000	.001617	.000034	.000017	.000017	
12,750	51,000	.001667	.000050	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001733	.000050	.....	.....	Elastic limit.
13,500	54,000	.001800	.000067	.....	.....	
13,750	55,000	.001900	.000100	.000117	.000100	
14,000	56,000	.002083	.000183	.....	.....	
14,250	57,000	.002450	.000367	.....	.....	
14,500	58,000	.003150	.000700	.....	.....	
14,750	59,000	.003583	.000433	.....	.....	
15,000	60,000	.004733	.001150	.002500	.002383	
15,500	62,000	.006000	.001267	.....	.....	
16,000	64,000	.007500	.001500	.....	.....	
16,500	66,000	.009167	.001667	.....	.....	
17,000	68,000	.010833	.001666	.....	.....	
17,500	70,000	.012250	.001417	.....	.....	
18,000	72,000	.013933	.001683	.....	.....	
18,500	74,000	.015783	.001850	.....	.....	
19,000	76,000	.017217	.001434	.....	.....	
19,500	78,000	.019400	.002183	.....	.....	
20,000	80,000	.021333	.001933	.....	.....	
20,500	82,000	.023417	.002084	.....	.....	
21,000	84,000	.025500	.002083	.....	.....	
21,500	86,000	.028450	.002950	.....	.....	
22,000	88,000	.031333	.002883	.....	.....	
22,500	90,000	.034000	.002667	.....	.....	
23,000	92,000	.0367	.0027	.....	.....	
23,500	94,000	.0400	.0033	.....	.....	
24,000	96,000	.0450	.0050	.....	.....	
24,500	98,000	.0517	.0067	.....	.....	
25,000	100,000	.0583	.0066	.....	.....	
25,500	102,000	.0717	.0134	.....	.....	
26,000	104,000	.0883	.0166	.....	.....	
26,150	104,600	.1133	.0250	.....	.....	Tensile strengtl

General summary.

Specific gravity .....

Hardness .....

Tensile strength per square inch of original section ..... pounds

Elastic limit per square inch of original section ..... do.

Elongation per inch after rupture ..... inch

Elongation per inch under strain at elastic limit ..... do.

Reduction in diameter at point of rupture ..... do.

Reduction in area after rupture, per centum of original section .....

Position of rupture ..... ″.8 from mid

Character of broken surface ..... granular; dull s

Elongation of inch sections ..... ″.12, ″.18, ″.32″, ″.1

No. 1019.

12" H T
8, B
No. 3
eter, ".564.
onal area, .25 square inch.

lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000167	.000167	0.	.....	
10,000	.000317	.000150	0.	.....	
15,000	.000483	.000166	0.	.....	
20,000	.000667	.000184	0.	.....	
25,000	.000833	.000166	0.	.....	
30,000	.001000	.000167	.000017	.000017	
35,000	.001150	.000150	.000033	.000016	
40,000	.001317	.000167	.000033	0.	
41,000	.001333	.000016	.....	.....	
42,000	.001367	.000034	.....	.....	
43,000	.001383	.000016	.....	.....	
44,000	.001433	.000050	.....	.....	
45,000	.001467	.000034	.....	.....	
46,000	.001500	.000033	.....	.....	
47,000	.001533	.000033	.....	.....	
48,000	.001567	.000034	.....	.....	Elastic limit.
49,000	.001617	.000050	.....	.....	
50,000	.001700	.000083	.000117	.000084	
51,000	.001800	.000100	.....	.....	
52,000	.001900	.000100	.....	.....	
53,000	.002417	.000517	.....	.....	
54,000	.003117	.000700	.....	.....	
55,000	.003650	.000533	.001650	.001533	
56,000	.004183	.000533	.....	.....	
57,000	.004583	.000400	.....	.....	
58,000	.005500	.000917	.....	.....	
59,000	.006183	.000683	.....	.....	
60,000	.006700	.000517	.004467	.002817	
62,000	.008083	.001383	.....	.....	
64,000	.009667	.001584	.....	.....	
66,000	.011400	.001733	.....	.....	
68,000	.012867	.001467	.....	.....	
70,000	.014600	.001733	.....	.....	
72,000	.016417	.001817	.....	.....	
74,000	.018167	.001750	.....	.....	
76,000	.020000	.001833	.....	.....	
78,000	.022300	.002300	.....	.....	
80,000	.024500	.002200	.....	.....	
82,000	.026867	.002367	.....	.....	
84,000	.029583	.002716	.....	.....	
86,000	.032333	.002750	.....	.....	
88,000	.035333	.003000	.....	.....	
90,000	.0367	.001367	.....	.....	
92,000	.0400	.0033	.....	.....	
94,000	.0467	.0067	.....	.....	
96,000	.0533	.0066	.....	.....	
98,000	.0617	.0084	.....	.....	
100,000	.0717	.0100	.....	.....	
102,000	.1300	.0583	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	102,000
per square inch of original section	do...	48,000
er inch after rupture	inch..	0.1550
er inch under strain at elastic limit	do...	.001567
diameter at point of rupture	do...	.114
area after rupture, per centum of original section		36.4
upture		¾ inch from middle of stem
broken surface	silky; with ring of granular metal at circumference	
f inch sections		".11, ".17, ".32*, ".14, ".11, ".08

No. 1020.

Marks, 12″ H T / B / No. 4
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Rema
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000250	.000133	0.	.....	
3,750	15,000	.000450	.000200	0.	.....	
5,000	20,000	.000583	.000133	0.	.....	
6,250	25,000	.000717	.000134	0.	.....	
7,500	30,000	.000917	.000200	0.	.....	
8,750	35,000	.001050	.000133	0.	.....	
10,000	40,000	.001250	.000200	0.	.....	
10,250	41,000	.001267	.000017	.....	.....	
10,500	42,000	.001283	.000016	.....	.....	
10,750	43,000	.001317	.000034	.....	.....	
11,000	44,000	.001367	.000050	.....	.....	
11,250	45,000	.001400	.000033	0.	.....	
11,500	46,000	.001450	.000050	.....	.....	
11,750	47,000	.001467	.000017	.....	.....	
12,000	48,000	.001483	.000016	.....	.....	
12,250	49,000	.001533	.000050	.....	.....	Elastic limit.
12,500	50,000	.001600	.000067	.000033	.000033	
12,750	51,000	.001717	.000117	.....	.....	
13,000	52,000	.001900	.000183	.....	.....	
13,250	53,000	.002167	.000267	.....	.....	
13,500	54,000	.003467	.001300	.....	.....	
13,750	55,000	.004233	.000766	.002233	.002200	
14,000	56,000	.005067	.000834	.....	.....	
14,250	57,000	.005233	.000166	.....	.....	
14,500	58,000	.005833	.000600	.....	.....	
14,750	59,000	.007000	.001167	.....	.....	
15,000	60,000	.007917	.000917	.005617	.003384	
15,500	62,000	.008917	.001000	.....	.....	
16,000	64,000	.010583	.001666	.....	.....	
16,500	66,000	.012567	.001984	.....	.....	
17,000	68,000	.013933	.001366	.....	.....	
17,500	70,000	.016333	.002400	.....	.....	
18,000	72,000	.018167	.001834	.....	.....	
18,500	74,000	.020083	.001916	.....	.....	
19,000	76,000	.021667	.001584	.....	.....	
19,500	78,000	.024583	.002916	.....	.....	
20,000	80,000	.027333	.002750	.....	.....	
20,500	82,000	.029250	.001917	.....	.....	
21,000	84,000	.032000	.002750	.....	.....	
21,500	86,000	.036000	.004000	.....	.....	
22,000	88,000	.0367	.0007	.....	.....	
22,500	90,000	.0433	.0066	.....	.....	
23,000	92,000	.0483	.0050	.....	.....	
23,500	94,000	.0517	.0034	.....	.....	
24,000	96,000	.0617	.0100	.....	.....	
24,500	98,000	.0750	.0133	.....	.....	
25,000	100,000	.1000	.0250	.....	.....	
25,100	100,400	.1317	.0317	.....	.....	Tensile strei

General summary.

Tensile strength per square inch of original section ..... po
Elastic limit per square inch of original section .....
Elongation per inch after rupture .....
Elongation per inch under strain at elastic limit .....
Reduction in diameter at point of rupture .....
Reduction in area after rupture, per centum of original section .....
Position of rupture .....
Character of broken surface ..... silky center; granular at
Elongation of inch sections ..... ″.28*, ″.22, ″.13

No. 1023.

rks, 12 H & T / T / No. 1
ımeter, ".564.
:tional area, .25 square inch.

·pplied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
ıal.	Per square inch.					
ıds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
250	5,000	.000167	.000167	0.	.....	
500	10,000	.000333	.000166	0.	.....	
750	15,000	.000500	.000167	0.	.....	
000	20,000	.000667	.000167	0.	.....	
250	25,000	.000867	.000200	.000033	.000033	
500	30,000	.001033	.000166	.000033	0.	
750	35,000	.001200	.000167	.000033	0.	
000	40,000	.001367	.000167	.000067	.000034	
250	45,000	.001533	.000166	.000100	.000033	
500	50,000	.001700	.000167	.000133	.000033	
750	51,000	.001733	.000033	.....	.....	
,000	52,000	.001767	.000034	.....	.....	Elastic limit.
,250	53,000	.001867	.000100	.....	.....	
,500	54,000	.003333	.001466	.....	.....	
,750	55,000	.009333	.006000	.007000	.006867	
,000	56,000	.009667	.000334	.....	.....	
,250	57,000	.010333	.000666	.....	.....	
,500	58,000	.010667	.000334	.....	.....	
,750	59,000	.011233	.000566	.....	.....	
5,000	60,000	.011933	.000700	.009433	.002433	
15,500	62,000	.013433	.001500	.....	.....	
16,000	64,000	.015100	.001667	.....	.....	
16,500	66,000	.017000	.001900	.....	.....	
17,000	68,000	.019167	.002167	.....	.....	
17,500	70,000	.021667	.002500	.....	.....	
18,000	72,000	.024233	.002566	.....	.....	
18,500	74,000	.026667	.002434	.....	.....	
19,000	76,000	.029933	.002266	.....	.....	
19,500	78,000	.032167	.003234	.....	.....	
20,000	80,000	.035267	.003100	.....	.....	
20,500	82,000	.039100	.003833	.....	.....	
21,000	84,000	.043333	.004233	.....	.....	
21,500	86,000	.048433	.005100	.....	.....	
22,000	88,000	.054667	.006234	.....	.....	
22,500	90,000	.062167	.007500	.....	.....	
23,000	92,000	.0733	.011133	.....	.....	
23,500	94,000	.0933	.0200	.....	.....	
24,000	96,000	.1267	.0334	.....	.....	
24,100	96,400	.1500	.0233	.....	.....	Tensile strength.

General summary.

le strength per square inch of original section	pounds..	96,400
c limit per square inch of original section	do...	52,000
ıtion per inch after rupture	inch..	0.2033
ıtion per inch under strain at elastic limit	do...	.001767
ion in diameter at point of rupture	do...	.124
ion in area after rupture, per centum of original section		39.2
n of rupture		1".2 from neck
ter of broken surface		silky
tion of inch sections		".26*, ".24, ".11

No. 1024.

Marks, 12″ H & T / T / No. 2

Diameter, ″.564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarl
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	.....	.....	
2,500	10,000	.000333	.000166	.....	.....	
3,750	15,000	.000500	.000167	.....	.....	
5,000	20,000	.000667	.000167	.....	.....	
6,250	25,000	.000833	.000166	.....	.....	
7,500	30,000	.001033	.000200	.000033	.000033	
8,750	35,000	.001167	.000134	.000033	0.	
10,000	40,000	.001333	.000166	.000067	.000034	
11,250	45,000	.001533	.000200	.....	.....	
11,500	46,000	.001567	.000034	.....	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	Elastic limit.
12,250	49,000	.003667	.002034	.....	.....	
12,500	50,000	.006767	.003100	.004767	.004700	
12,750	51,000	.007100	.000333	.....	.....	
13,000	52,000	.007600	.000500	.....	.....	
13,250	53,000	.008100	.000500	.....	.....	
13,500	54,000	.009200	.001100	.....	.....	
13,750	55,000	.009767	.000567	.007467	.002700	
14,000	56,000	.010667	.000900	.....	.....	
14,250	57,000	.011367	.000700	.....	.....	
14,500	58,000	.012233	.000866	.....	.....	
14,750	59,000	.013067	.000834	.....	.....	
15,000	60,000	.013967	.000900	.011467	.004000	
15,500	62,000	.015733	.001766	.....	.....	
16,000	64,000	.017833	.002100	.....	.....	
16,500	66,000	.020033	.002200	.....	.....	
17,000	68,000	.022667	.002634	.....	.....	
17,500	70,000	.025067	.002400	.....	.....	
18,000	72,000	.027533	.002466	.....	.....	
18,500	74,000	.030433	.002900	.....	.....	
19,000	76,000	.033733	.003300	.....	.....	
19,500	78,000	.037400	.003667	.....	.....	
20,000	80,000	.041867	.004467	.....	.....	
20,500	82,000	.047067	.005200	.....	.....	
21,000	84,000	.052667	.005600	.....	.....	
21,500	86,000	.059300	.006633	.....	.....	
22,000	88,000	.0700	.0107	.....	.....	
22,500	90,000	.0867	.0167	.....	.....	
22,950	91,800	.....	.....	.....	.....	Tensile stren

General summary.

Specific gravity.....

Hardness.....

Tensile strength per square inch of original section.....pou

Elastic limit per square inch of original section.....

Elongation per inch after rupture.....i

Elongation per inch under strain at elastic limit.....

Reduction in diameter at point of rupture.....

Reduction in area after rupture, per centum of original section.....

Position of rupture.....⅜ inch from

Character of broken surface.....granular; fractured at defective sp

Elongation of inch sections.....″

No. 1025.

12" H & T
T
No. 3
eter, ".564.
nal area, .25 square inch.

lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000167	.000167	0.	.....	
10,000	.000300	.000133	0.	.....	
15,000	.000500	.000200	0.	.....	
20,000	.000667	.000167	0.	.....	
25,000	.000833	.000166	0.	.....	
30,000	.001000	.000167	.000033	.000033	
35,000	.001167	.000167	.000033	0.	
40,000	.001400	.000233	.000067	.000034	
45,000	.001600	.000200	.000067	0.	
46,000	.001633	.000033	.....	.....	
47,000	.001667	.000034	.....	.....	
48,000	.001733	.000066	.....	.....	Elastic limit.
49,000	.001867	.000134	.....	.....	
50,000	.007833	.005966	.005767	.005700	
51,000	.008167	.000334	.....	.....	
52,000	.008667	.000500	.....	.....	
53,000	.009000	.000333	.....	.....	
54,000	.009933	.000933	.....	.....	
55,000	.010700	.000767	.008367	.002600	
56,000	.011667	.000967	.....	.....	
57,000	.012367	.000700	.....	.....	
58,000	.013267	.000900	.....	.....	
59,000	.014033	.000766	.....	.....	
60,000	.015367	.001334	.012700	.004333	
62,000	.017167	.001800	.....	.....	
64,000	.019000	.001833	.....	.....	
66,000	.021667	.002667	.....	.....	
68,000	.024067	.002400	.....	.....	
70,000	.026732	.002666	.....	.....	
72,000	.029667	.002934	.....	.....	
74,000	.032700	.003033	.....	.....	
76,000	.036333	.003633	.....	.....	
78,000	.040000	.003667	.....	.....	
80,000	.044700	.004700	.....	.....	
82,000	.050000	.005300	.....	.....	
84,000	.057000	.007000	.....	.....	
86,000	.064667	.007667	.....	.....	
88,000	.076333	.011666	.....	.....	
90,000	.0967	.020367	.....	.....	
92,000	.1200	.0233	.....	.....	
92,800	.1500	.0300	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	92,800
per square inch of original section	do...	48,000
per inch after rupture	inch..	0.2200
per inch under strain at elastic limit	do...	001733
diameter at point of rupture	do ..	.134
area after rupture, per centum of original section		41.9
rupture	¼ inch from middle of stem	
broken surface		silky
of inch sections		".15, ".35*, ".16

No. 549.

Marks, 12″ H & T / T / No. 4
Length, 5″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000650	.000200	0.	.....	
12,500	25,000	.000800	.000150	0.	.....	
15,000	30,000	.000950	.000150	0.	.....	
17,500	35,000	.001100	.000150	0.	.....	
20,000	40,000	.001300	.000200	.000050	.000050	
22,500	45,000	.001400	.000100	.000050	0.	
25,000	50,000	.001700	.000300	.000100	.000050	
25,500	51,000	.001750	.000050	.....	.....	Elastic limit.
26,000	52,000	.005400	.003650	.....	.....	
26,500	53,000	.006400	.001000	.....	.....	
27,000	54,000	.007450	.001050	.....	.....	
27,500	55,000	.008350	.000900	.006200	.006100	
28,000	56,000	.009000	.000650	.....	.....	
28,500	57,000	.009500	.000500	.....	.....	
29,000	58,000	.010400	.000900	.....	.....	
29,500	59,000	.011000	.000600	.....	.....	
30,000	60,000	.011500	.000500	.009250	.003050	
44,850	89,700	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section .....pounds..
Compression per inch under stress at elastic limit .....inch..
Ultimate strength per square inch of original section .....pounds..
Manner of failure .....triple

No. 550.

Marks, 12" H & T / T / No. 5
Length, 5".
Diameter, ".798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000200	.000100	0.	.....	
7,500	15,000	.000350	.000150	0.	.....	
10,000	20,000	.000500	.000150	0.	.....	
12,500	25,000	.000650	.000150	0.	.....	
15,000	30,000	.000850	.000200	0.	.....	
17,500	35,000	.001000	.000150	0.	.....	
20,000	40,000	.001200	.000200	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
23,000	46,000	.001400	.000050	.....	.....	Elastic limit.
23,500	47,000	.001600	.000200	.....	.....	
24,000	48,000	.004600	.003000	.....	.....	
24,500	49,000	.005600	.001000	.....	.....	
25,000	50,000	.006100	.000500	.004350	.004350	
25,500	51,000	.006700	.000600	.....	.....	
26,000	52,000	.007150	.000450	.....	.....	
26,500	53,000	.007650	.000500	.....	.....	
27,000	54,000	.008300	.000650	.....	.....	
27,500	55,000	.009150	.000850	.007150	.002800	
28,000	56,000	.009800	.000650	.....	.....	
28,500	57,000	.010400	.000600	.....	.....	
29,000	58,000	.011250	.000850	.....	.....	
29,500	59,000	.011850	.000600	.....	.....	
30,000	60,000	.012700	.000850	.010400	.003250	
42,280	84,560	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001400
Ultimate strength per square inch of original section	pounds..	84,560
Manner of failure		triple flexure

No. 551.

Marks, 12″ H & T / T / No. 6
Length, 5″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000250	.000150	0.	.....	
7,500	15,000	.000400	.000150	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000750	.000200	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001150	.000250	0.	.....	
20,000	40,000	.001200	.000050	.000050	.000050	
22,500	45,000	.001500	.000300	.000100	.000050	
23,000	46,000	.001600	.000100	.....	.....	Elastic limit.
23,500	47,000	.001950	.003350	.....	.....	
24,000	48,000	.006100	.001150	.....	.....	
24,500	49,000	.006300	.000200	.....	.....	
25,000	50,000	.006800	.000500	.005100	.005000	
25,500	51,000	.007250	.000450	.....	.....	
26,000	52,000	.007750	.000500	.....	.....	
26,500	53,000	.008400	.000650	.....	.....	
27,000	54,000	.009000	.000600	.....	.....	
27,500	55,000	.009750	.000750	.007750	.002650	
28,000	56,000	.010250	.000500	.....	.....	
28,500	57,000	.010900	.000650	.....	.....	
29,000	58,000	.011650	.000750	.....	.....	
29,500	59,000	.012450	.000800	.....	.....	
30,000	60,000	.013150	.000700	.011000	.003250	
42,320	84,640	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001600
Ultimate strength per square inch of original section	pounds..	84,640
Manner of failure		triple flexure

No. 552.

Marks, 12″ H & T / T / No. 7
Length, 3″.22.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001150	.000250	0.	.....	
20,000	40,000	.001200	.000050	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
23,000	46,000	.001450	.000100	.....	.....	
23,500	47,000	.001450	0.	.....	.....	
24,000	48,000	.001500	.000050	.....	.....	
24,500	49,000	.001500	0.	.....	.....	
25,000	50,000	.001550	.000050	0.	.....	Elastic limit
25,500	51,000	.006000	.004450	.....	.....	
26,000	52,000	.006950	.000950	.....	.....	
26,500	53,000	.007450	.000500	.....	.....	
27,000	54,000	.008050	.000600	.....	.....	
27,500	55,000	.008750	.000700	.006650	.006650	
28,000	56,000	.009250	.000500	.....	.....	
28,500	57,000	.009850	.000600	.....	.....	
29,000	58,000	.010500	.000650	.....	.....	
29,500	59,000	.011200	.000700	.....	.....	
30,000	60,000	.012000	.000800	.010150	.003500	
65,000	130,000	.....	.....	.....	.....	Total load applied. Caused triple flexure and shortened specimen 1″.22.

No. 1020.

Marks, 12″ H T / B / No. 4
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000250	.000133	0.	.....	
3,750	15,000	.000450	.000200	0.	.....	
5,000	20,000	.000583	.000133	0.	.....	
6,250	25,000	.000717	.000134	0.	.....	
7,500	30,000	.000917	.000200	0.	.....	
8,750	35,000	.001050	.000133	0.	.....	
10,000	40,000	.001250	.000200	0.	.....	
10,250	41,000	.001267	.000017	.....	.....	
10,500	42,000	.001283	.000016	.....	.....	
10,750	43,000	.001317	.000034	.....	.....	
11,000	44,000	.001367	.000050	.....	.....	
11,250	45,000	.001400	.000033	0.	.....	
11,500	46,000	.001450	.000050	.....	.....	
11,750	47,000	.001467	.000017	.....	.....	
12,000	48,000	.001483	.000016	.....	.....	
12,250	49,000	.001533	.000050	.....	.....	Elastic limit.
12,500	50,000	.001600	.000067	.000033	.000033	
12,750	51,000	.001717	.000117	.....	.....	
13,000	52,000	.001900	.000183	.....	.....	
13,250	53,000	.002167	.000267	.....	.....	
13,500	54,000	.003467	.001300	.....	.....	
13,750	55,000	.004233	.000766	.002233	.002200	
14,000	56,000	.005067	.000834	.....	.....	
14,250	57,000	.005233	.000166	.....	.....	
14,500	58,000	.005833	.000600	.....	.....	
14,750	59,000	.007000	.001167	.....	.....	
15,000	60,000	.007917	.000917	.005617	.003384	
15,500	62,000	.008917	.001000	.....	.....	
16,000	64,000	.010583	.001666	.....	.....	
16,500	66,000	.012567	.001984	.....	.....	
17,000	68,000	.013933	.001366	.....	.....	
17,500	70,000	.016333	.002400	.....	.....	
18,000	72,000	.018167	.001834	.....	.....	
18,500	74,000	.020083	.001916	.....	.....	
19,000	76,000	.021667	.001584	.....	.....	
19,500	78,000	.024583	.002916	.....	.....	
20,000	80,000	.027333	.002750	.....	.....	
20,500	82,000	.029250	.001917	.....	.....	
21,000	84,000	.032000	.002750	.....	.....	
21,500	86,000	.036000	.004000	.....	.....	
22,000	88,000	.0367	.0007	.....	.....	
22,500	90,000	.0433	.0066	.....	.....	
23,000	92,000	.0483	.0050	.....	.....	
23,500	94,000	.0517	.0034	.....	.....	
24,000	96,000	.0617	.0100	.....	.....	
24,500	98,000	.0750	.0133	.....	.....	
25,000	100,000	.1000	.0250	.....	.....	
25,100	100,400	.1317	.0317	.....	.....	Tensile strength.

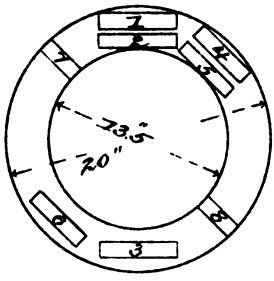
General summary.

Tensile strength per square inch of original section	pounds..	100,400
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	0.1567
Elongation per inch under strain at elastic limit	do...	.001533
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		1″.2 from neck
Character of broken surface		silky center; granular at circumference
Elongation of inch sections		″.28*, ″.22, ″.13, ″.11, ″.11, ″.09

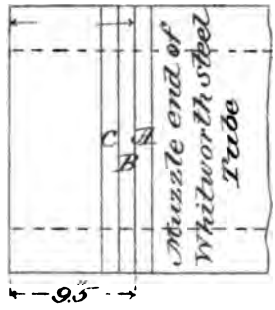
12" Cast Iron B.L. Rifle, hooped and tubed with steel.

Experimental cylinder. Tube section.

Test ring B



Experimental section



A Original test ring before hooping

B 1st test ring after unhooping

C 2nd " " " "

H Ex 31 49 2

No. 1023.

Marks, 12 H & T / T / No. 1
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000500	.000167	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000867	.000200	.000033	.000033	
7,500	30,000	.001033	.000166	.000033	0.	
8,750	35,000	.001200	.000167	.000033	0.	
10,000	40,000	.001367	.000167	.000067	.000034	
11,250	45,000	.001533	.000166	.000100	.000033	
12,500	50,000	.001700	.000167	.000133	.000033	
12,750	51,000	.001733	.000033	.....	.....	
13,000	52,000	.001767	.000034	.....	.....	Elastic limit.
13,250	53,000	.001867	.000100	.....	.....	
13,500	54,000	.003333	.001466	.....	.....	
13,750	55,000	.009333	.006000	.007000	.006867	
14,000	56,000	.009667	.000334	.....	.....	
14,250	57,000	.010333	.000666	.....	.....	
14,500	58,000	.010667	.000334	.....	.....	
14,750	59,000	.011233	.000566	.....	.....	
15,000	60,000	.011933	.000700	.009433	.002433	
15,500	62,000	.013433	.001500	.....	.....	
16,000	64,000	.015100	.001667	.....	.....	
16,500	66,000	.017000	.001900	.....	.....	
17,000	68,000	.019167	.002167	.....	.....	
17,500	70,000	.021667	.002500	.....	.....	
18,000	72,000	.024233	.002566	.....	.....	
18,500	74,000	.026667	.002434	.....	.....	
19,000	76,000	.028933	.002266	.....	.....	
19,500	78,000	.032167	.003234	.....	.....	
20,000	80,000	.035267	.003100	.....	.....	
20,500	82,000	.039100	.003833	.....	.....	
21,000	84,000	.043333	.004233	.....	.....	
21,500	86,000	.048433	.005100	.....	.....	
22,000	88,000	.054667	.006234	.....	.....	
22,500	90,000	.062167	.007500	.....	.....	
23,000	92,000	.0733	.011133	.....	.....	
23,500	94,000	.0933	.0200	.....	.....	
24,000	96,000	.1267	.0334	.....	.....	
24,100	96,400	.1500	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,400
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.2033
Elongation per inch under strain at elastic limit	do...	.001767
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		1".2 from neck
Character of broken surface		silky
Elongation of inch sections		".26*, ".24, ".11

No. 1024.

Marks, 12" H & T / T / No. 2

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads. Total	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	.....	.....	
2,500	10,000	.000333	.000166	.....	.....	
3,750	15,000	.000500	.000167	.....	.....	
5,000	20,000	.000667	.000167	.....	.....	
6,250	25,000	.000833	.000166	.....	.....	
7,500	30,000	.001000	.000167	.000033	.000033	
8,750	35,000	.001167	.000134	.000033	0.	
10,000	40,000	.001333	.000166	.000067	.000034	
11,250	45,000	.001500	.000167	.....	.....	
11,500	46,000	.001567	.000034	.....	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	Elastic limit.
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.000767	.000900	.001767	.001700	
12,750	51,000	.001700	.000933	.....	.....	
13,000	52,000	.002600	.000900	.....	.....	
13,250	53,000	.003500	.000900	.....	.....	
13,500	54,000	.004400	.000900	.....	.....	
13,750	55,000	.005267	.000867	.005467	.005700	
14,000	56,000	.006167	.000900	.....	.....	
14,250	57,000	.007067	.000900	.....	.....	
14,500	58,000	.007933	.000866	.....	.....	
14,750	59,000	.008867	.000934	.....	.....	
15,000	60,000	.009767	.000900	.011467	.010600	
15,250	61,000	.010667	.000900	.....	.....	
15,500	62,000	.011567	.000900	.....	.....	
15,750	63,000	.012467	.000900	.....	.....	
16,000	64,000	.013367	.000900	.....	.....	
16,250	65,000	.014267	.000900	.....	.....	
16,500	66,000	.015167	.000900	.....	.....	
16,750	67,000	.016067	.000900	.....	.....	
17,000	68,000	.016967	.000900	.....	.....	
17,250	69,000	.017867	.000900	.....	.....	
17,500	70,000	.018767	.000900	.....	.....	
17,750	71,000	.019667	.000900	.....	.....	
18,000	72,000	.020567	.000900	.....	.....	
18,250	73,000	.021467	.000900	.....	.....	
18,500	74,000	.022367	.000900	.....	.....	
18,750	75,000	.023267	.000900	.....	.....	
19,000	76,000	.024167	.000900	.....	.....	
19,250	77,000	.025067	.000900	.....	.....	
19,500	78,000	.025967	.000900	.....	.....	
19,750	79,000	.026867	.000900	.....	.....	
20,000	80,000	.027767	.000900	.....	.....	
20,250	81,000	.028667	.000900	.....	.....	
20,500	82,000	.029567	.000900	.....	.....	
20,750	83,000	.030467	.000900	.....	.....	
21,000	84,000	.031367	.000900	.....	.....	
21,250	85,000	.032267	.000900	.....	.....	
21,500	86,000	.033167	.000900	.....	.....	
21,750	87,000	.034067	.000900	.....	.....	
22,000	88,000	.034967	.000900	.....	.....	
22,250	89,000	.035867	.000900	.....	.....	
22,500	90,000	.036767	.000900	.....	.....	
22,750	91,000	.037667	.000900	.....	.....	
23,000	92,000	.038567	.000900	.....	.....	
23,250	93,000	.039467	.000900	.....	.....	
23,500	94,000	.040367	.000900	.....	.....	
23,750	95,000	.041267	.000900	.....	.....	
24,000	96,000	.042167	.000900	.....	.....	
24,250	97,000	.043067	.000900	.....	.....	
24,500	98,000	.043967	.000900	.....	.....	
24,750	99,000	.044867	.000900	.....	.....	
25,000	100,000	.045767	.000900	.....	.....	
25,250	101,000	.046667	.000900	.....	.....	
25,500	102,000	.047567	.000900	.....	.....	
25,750	103,000	.048467	.000900	.....	.....	
26,000	104,000	.049367	.000900	.....	.....	
26,250	105,000	.050267	.000900	.....	.....	
26,500	106,000	.051167	.000900	.....	.....	
26,750	107,000	.052067	.000900	.....	.....	
27,000	108,000	.052967	.000900	.....	.....	
27,250	109,000	.053867	.000900	.....	.....	
27,500	110,000	.054767	.000900	.....	.....	
27,750	111,000	.055667	.000900	.....	.....	
28,000	112,000	.056567	.000900	.....	.....	
28,250	113,000	.057467	.000900	.....	.....	
28,500	114,000	.058367	.000900	.....	.....	
28,750	115,000	.059267	.000900	.....	.....	
29,000	116,000	.060167	.000900	.....	.....	
29,250	117,000	.061067	.000900	.....	.....	
29,500	118,000	.061967	.000900	.....	.....	
29,750	119,000	.062867	.000900	.....	.....	
30,000	120,000	.063767	.000900	.....	.....	
30,250	121,000	.064667	.000900	.....	.....	
30,500	122,000	.065567	.000900	.....	.....	
30,750	123,000	.066467	.000900	.....	.....	
31,000	124,000	.067367	.000900	.....	.....	
31,250	125,000	.068267	.000900	.....	.....	
31,500	126,000	.069167	.000900	.....	.....	
31,750	127,000	.070067	.000900	.....	.....	
32,000	128,000	.070967	.000900	.....	.....	
32,250	129,000	.071867	.000900	.....	.....	
32,500	130,000	.072767	.000900	.....	.....	
32,750	131,000	.073667	.000900	.....	.....	
33,000	132,000	.074567	.000900	.....	.....	
33,250	133,000	.075467	.000900	.....	.....	
33,500	134,000	.076367	.000900	.....	.....	
33,750	135,000	.077267	.000900	.....	.....	
34,000	136,000	.078167	.000900	.....	.....	
34,250	137,000	.079067	.000900	.....	.....	
34,500	138,000	.079967	.000900	.....	.....	
34,750	139,000	.080867	.000900	.....	.....	
35,000	140,000	.081767	.000900	.....	.....	
35,250	141,000	.082667	.000900	.....	.....	
35,500	142,000	.083567	.000900	.....	.....	
35,750	143,000	.084467	.000900	.....	.....	
36,000	144,000	.085367	.000900	.....	.....	
36,250	145,000	.086267	.000900	.....	.....	
36,500	146,000	.087167	.000900	.....	.....	
36,750	147,000	.088067	.000900	.....	.....	
37,000	148,000	.088967	.000900	.....	.....	
37,250	149,000	.089867	.000900	.....	.....	
37,500	150,000	.090767	.000900	.....	.....	
37,750	151,000	.091667	.000900	.....	.....	
38,000	152,000	.092567	.000900	.....	.....	
38,250	153,000	.093467	.000900	.....	.....	
38,500	154,000	.094367	.000900	.....	.....	
38,750	155,000	.095267	.000900	.....	.....	
39,000	156,000	.096167	.000900	.....	.....	
39,250	157,000	.097067	.000900	.....	.....	
39,500	158,000	.097967	.000900	.....	.....	
39,750	159,000	.098867	.000900	.....	.....	
40,000	160,000	.099767	.000900	.....	.....	
40,250	161,000	.100667	.000900	.....	.....	
40,500	162,000	.101567	.000900	.....	.....	
40,750	163,000	.102467	.000900	.....	.....	
41,000	164,000	.103367	.000900	.....	.....	
41,250	165,000	.104267	.000900	.....	.....	
41,500	166,000	.105167	.000900	.....	.....	
41,750	167,000	.106067	.000900	.....	.....	
42,000	168,000	.106967	.000900	.....	.....	
42,250	169,000	.107867	.000900	.....	.....	
42,500	170,000	.108767	.000900	.....	.....	
42,750	171,000	.109667	.000900	.....	.....	
43,000	172,000	.110567	.000900	.....	.....	
43,250	173,000	.111467	.000900	.....	.....	
43,500	174,000	.112367	.000900	.....	.....	
43,750	175,000	.113267	.000900	.....	.....	
44,000	176,000	.114167	.000900	.....	.....	
44,250	177,000	.115067	.000900	.....	.....	
44,500	178,000	.115967	.000900	.....	.....	
44,750	179,000	.116867	.000900	.....	.....	
45,000	180,000	.117767	.000900	.....	.....	
45,250	181,000	.118667	.000900	.....	.....	
45,500	182,000	.119567	.000900	.....	.....	
45,750	183,000	.120467	.000900	.....	.....	
46,000	184,000	.121367	.000900	.....	.....	
46,250	185,000	.122267	.000900	.....	.....	
46,500	186,000	.123167	.000900	.....	.....	
46,750	187,000	.124067	.000900	.....	.....	
47,000	188,000	.124967	.000900	.....	.....	
47,250	189,000	.125867	.000900	.....	.....	
47,500	190,000	.126767	.000900	.....	.....	
47,750	191,000	.127667	.000900	.....	.....	
48,000	192,000	.128567	.000900	.....	.....	
48,250	193,000	.129467	.000900	.....	.....	
48,500	194,000	.130367	.000900	.....	.....	
48,750	195,000	.131267	.000900	.....	.....	
49,000	196,000	.132167	.000900	.....	.....	
49,250	197,000	.133067	.000900	.....	.....	
49,500	198,000	.133967	.000900	.....	.....	
49,750	199,000	.134867	.000900	.....	.....	
50,000	200,000	.135767	.000900	.....	.....	
50,250	201,000	.136667	.000900	.....	.....	
50,500	202,000	.137567	.000900	.....	.....	
50,750	203,000	.138467	.000900	.....	.....	
51,000	204,000	.139367	.000900	.....	.....	
51,250	205,000	.140267	.000900	.....	.....	
51,500	206,000	.141167	.000900	.....	.....	
51,750	207,000	.142067	.000900	.....	.....	
52,000	208,000	.142967	.000900	.....	.....	
52,250	209,000	.143867	.000900	.....	.....	
52,500	210,000	.144767	.000900	.....	.....	
52,750	211,000	.145667	.000900	.....	.....	
53,000	212,000	.146567	.000900	.....	.....	
53,250	213,000	.147467	.000900	.....	.....	
53,500	214,000	.148367	.000900	.....	.....	
53,750	215,000	.149267	.000900	.....	.....	
54,000	216,000	.150167	.000900	.....	.....	
54,250	217,000	.151067	.000900	.....	.....	
54,500	218,000	.151967	.000900	.....	.....	
54,750	219,000	.152867	.000900	.....	.....	
55,000	220,000	.153767	.000900	.....	.....	
55,250	221,000	.154667	.000900	.....	.....	
55,500	222,000	.155567	.000900	.....	.....	
55,750	223,000	.156467	.000900	.....	.....	
56,000	224,000	.157367	.000900	.....	.....	
56,250	225,000	.158267	.000900	.....	.....	
56,500	226,000	.159167	.000900	.....	.....	
56,750	227,000	.160067	.000900	.....	.....	
57,000	228,000	.160967	.000900	.....	.....	
57,250	229,000	.161867	.000900	.....	.....	
57,500	230,000	.162767	.000900	.....	.....	
57,750	231,000	.163667	.000900	.....	.....	
58,000	232,000	.164567	.000900	.....	.....	
58,250	233,000	.165467	.000900	.....	.....	
58,500	234,000	.166367	.000900	.....	.....	
58,750	235,000	.167267	.000900	.....	.....	
59,000	236,000	.168167	.000900	.....	.....	
59,250	237,000	.169067	.000900	.....	.....	
59,500	238,000	.169967	.000900	.....	.....	
59,750	239,000	.170867	.000900	.....	.....	
60,000	240,000	.171767	.000900	.....	.....	
60,250	241,000	.172667	.000900	.....	.....	
60,500	242,000	.173567	.000900	.....	.....	
60,750	243,000	.174467	.000900	.....	.....	
61,000	244,000	.175367	.000900	.....	.....	
61,250	245,000	.176267	.000900	.....	.....	
61,500	246,000	.177167	.000900	.....	.....	
61,750	247,000	.178067	.000900	.....	.....	
62,000	248,000	.178967	.000900	.....	.....	
62,250	249,000	.179867	.000900	.....	.....	
62,500	250,000	.180767	.000900	.....	.....	
62,750	251,000	.181667	.000900	.....	.....	
63,000	252,000	.182567	.000900	.....	.....	
63,250	253,000	.183467	.000900	.....	.....	
63,500	254,000	.184367	.000900	.....	.....	
63,750	255,000	.185267	.000900	.....	.....	
64,000	256,000	.186167	.000900	.....	.....	
64,250	257,000	.187067	.000900	.....	.....	
64,500	258,000	.187967	.000900	.....	.....	
64,750	259,000	.188867	.000900	.....	.....	
65,000	260,000	.189767	.000900	.....	.....	
65,250	261,000	.190667	.000900	.....	.....	
65,500	262,000	.191567	.000900	.....	.....	
65,750	263,000	.192467	.000900	.....	.....	
66,000	264,000	.193367	.000900	.....	.....	
66,250	265,000	.194267	.000900	.....	.....	
66,500	266,000	.195167	.000900	.....	.....	
66,750	267,000	.196067	.000900	.....	.....	
67,000	268,000	.196967	.000900	.....	.....	
67,250	269,000	.197867	.000900	.....	.....	
67,500	270,000	.198767	.000900	.....	.....	
67,750	271,000	.199667	.000900	.....	.....	
68,000	272,000	.200567	.000900	.....	.....	
68,250	273,000	.201467	.000900	.....	.....	
68,500	274,000	.202367	.000900	.....	.....	
68,750	275,000	.203267	.000900	.....	.....	
69,000	276,000	.204167	.000900	.....	.....	
69,250	277,000	.205067	.000900	.....	.....	
69,500	278,000	.205967	.000900	.....	.....	
69,750	279,000	.206867	.000900	.....	.....	
70,000	280,000	.207767	.000900	.....	.....	
70,250	281,000	.208667	.000900	.....	.....	
70,500	282,000	.209567	.000900	.....	.....	
70,750	283,000	.210467	.000900	.....	.....	
71,000	284,000	.211367	.000900	.....	.....	
71,250	285,000	.212267	.000900	.....	.....	
71,500	286,000	.213167	.000900	.....	.....	
71,750	287,000	.214067	.000900	.....	.....	
72,000	288,000	.214967	.000900	.....	.....	
72,250	289,000	.215867	.000900	.....	.....	
72,500	290,000	.216767	.000900	.....	.....	
72,750	291,000	.217667	.000900	.....	.....	
73,000	292,000	.218567	.000900	.....	.....	
73,250	293,000	.219467	.000900	.....	.....	
73,500	294,000	.220367	.000900	.....	.....	
73,750	295,000	.221267	.000900	.....	.....	
74,000	296,000	.222167	.000900	.....	.....	
74,250	297,000	.223067	.000900	.....	.....	
74,500	298,000	.223967	.000900	.....	.....	
74,750	299,000	.224867	.000900	.....	.....	
75,000	300,000	.225767	.000900	.....	.....	
75,250	301,000	.226667	.000900	.....	.....	
75,500	302,000	.227567	.000900	.....	.....	
75,750	303,000	.228467	.000900	.....	.....	
76,000	304,000	.229367	.000900	.....	.....	
76,250	305,000	.230267	.000900	.....	.....	
76,500	306,000	.231167	.000900	.....	.....	
76,750	307,000	.232067	.000900	.....	.....	
77,000	308,000	.232967	.000900	.....	.....	
77,250	309,000	.233867	.000900	.....	.....	
77,500	310,000	.234767	.000900	.....	.....	
77,750	311,000	.235667	.000900	.....	.....	
78,000	312,000	.236567	.000900	.....	.....	
78,250	313,000	.237467	.000900	.....	.....	
78,500	314,000	.238367	.000900	.....	.....	
78,750	315,000	.239267	.000900	.....	.....	
79,000	316,000	.240167	.000900	.....	.....	
79,250	317,000	.241067	.000900	.....	.....	
79,500	318,000	.241967	.000900	.....	.....	
79,750	319,000	.242867	.000900	.....	.....	
80,000	320,000	.243767	.000900	.....	.....	
80,250	321,000	.244667	.000900	.....	.....	
80,500	322,000	.245567	.000900	.....	.....	
80,750	323,000	.246467	.000900	.....	.....	
81,000	324,000	.247367	.000900	.....	.....	
81,250	325,000	.248267	.000900	.....	.....	
81,500	326,000	.249167	.000900	.....	.....	
81,750	327,000	.250067	.000900	.....	.....	
82,000	328,000	.250967	.000900	.....	.....	
82,250	329,000	.251867	.000900	.....	.....	
82,500	330,000	.252767	.000900	.....	.....	
82,750	331,000	.253667	.000900	.....	.....	
83,000	332,000	.254567	.000900	.....	.....	
83,250	333,000	.255467	.000900	.....	.....	
83,500	334,000	.256367	.000900	.....	.....	
83,750	335,000	.257267	.000900	.....	.....	
84,000	336,000	.258167	.000900	.....	.....	
84,250	337,000	.259067	.000900	.....	.....	
84,500	338,000	.259967	.000900	.....	.....	
84,750	339,000	.260867	.000900	.....	.....	
85,000	340,000	.261767	.000900	.....	.....	
85,250	341,000	.262667	.000900	.....	.....	
85,500	342,000	.263567	.000900	.....	.....	
85,750	343,000	.264467	.000900	.....	.....	
86,000	344,000	.265367	.000900	.....	.....	
86,250	345,000	.266267	.000900	.....	.....	
86,500	346,000	.267167	.000900	.....	.....	
86,750	347,000	.268067	.000900	.....	.....	
87,000	348,000	.268967	.000900	.....	.....	
87,250	349,000	.269867	.000900	.....	.....	
87,500	350,000	.270767	.000900	.....	.....	
87,750	351,000	.271667	.000900	.....	.....	
88,000	352,000	.272567	.000900	.....	.....	
88,250	353,000	.273467	.000900	.....	.....	
88,500	354,000	.274367	.000900	.....	.....	
88,750	355,000	.275267	.000900	.....	.....	
89,000	356,000	.276167	.000900	.....	.....	
89,250	357,000	.277067	.000900	.....	.....	
89,500	358,000	.277967	.000900	.....	.....	
89,750	359,000	.278867	.000900	.....	.....	
90,000	360,000	.279767	.000900	.....	.....	
90,250	361,000	.280667	.000900	.....	.....	
90,500	362,000	.281567	.000900	.....	.....	
90,750	363,000	.282467	.000900	.....	.....	
91,000	364,000	.283367	.000900	.....	.....	
91,250	365,000	.284267	.000900	.....	.....	
91,500	366,000	.285167	.000900	.....	.....	
91,750	367,000	.286067	.000900	.....	.....	
92,000	368,000	.286967	.000900	.....	.....	
92,250	369,000	.287867	.000900	.....	.....	
92,500	370,000	.288767	.000900	.....	.....	
92,750	371,000	.289667	.000900	.....	.....	
93,000	372,000	.290567	.000900	.....	.....	
93,250	373,000	.291467	.000900	.....	.....	
93,500	374,000	.292367	.000900	.....	.....	
93,750	375,000	.293267	.000900	.....	.....	
94,000	376,000	.294167	.000900	.....	.....	
94,250	377,000	.295067	.000900	.....	.....	
94,500	378,000	.295967	.000900	.....	.....	
94,750	379,000	.296867	.000900	.....	.....	
95,000	380,000	.297767	.000900	.....	.....	
95,250	381,000	.298667	.000900	.....	.....	
95,500	382,000	.299567	.000900	.....	.....	
95,750	383,000	.300467	.000900	.....	.....	
96,000	384,000	.301367	.000900	.....	.....	
96,250	385,000	.302267	.000900	.....	.....	
96,500	386,000	.303167	.000900	.....	.....	
96,750	387,000	.304067	.000900	.....	.....	
97,000	388,000	.304967	.000900	.....	.....	
97,250	389,000	.305867	.000900	.....	.....	
97,500	390,000	.306767	.000900	.....	.....	
97,750	391,000	.307667	.000900	.....	.....	
98,000	392,000	.308567	.000900	.....	.....	
98,250	393,000	.309467	.000900	.....	.....	
98,500	394,000	.310367	.000900	.....	.....	
98,750	395,000	.311267	.000900	.....	.....	
99,000	396,000	.312167	.000900	.....	.....	
99,250	397,000	.313067	.000900	.....	.....	
99,500	398,000	.313967	.000900	.....	.....	
99,750	399,000	.314867	.000900	.....	.....	
100,000	400,000	.315767	.000900	.....	.....	
100,250	401,000	.316667	.000900	.....	.....	
100,500	402,000	.317567	.000900	.....	.....	
100,750	403,000	.318467	.000900	.....	.....	
101,000	404,000	.319367	.000900	.....	.....	
101,250	405,000	.320267	.000900	.....	.....	
101,500	406,000	.321167	.000900	.....	.....	
101,750	407,000	.322067	.000900	.....	.....	
102,000	408,000	.322967	.000900	.....	.....	
102,250	409,000	.323867	.000900	.....	.....	
102,500	410,000	.324767	.000900	.....	.....	
102,750	411,000	.325667	.000900	.....	.....	
103,000	412,000	.326567	.000900	.....	.....	
103,250	413,000	.327467	.000900	.....	.....	
103,500	414,000	.328367	.000900	.....	.....	
103,750	415,000	.329267	.000900	.....	.....	
104,000	416,000	.330167	.000900	.....	.....	
104,250	417,000	.331067	.000900	.....	.....	
104,500	418,000	.331967	.000900	.....	.....	
104,750	419,000	.332867	.000900	.....	.....	
105,000	420,000	.333767	.000900	.....	.....	
105,250	421,000	.334667	.000900	.....	.....	
105,500	422,000	.335567	.000900	.....	.....	
105,750	423,000	.336467	.000900	.....	.....	
106,000	424,000	.337367	.000900	.....	.....	
106,250	425,000	.338267	.000900	.....	.....	
106,500	426,000	.339167	.000900	.....	.....	
106,750	427,000	.340067	.000900	.....	.....	
107,000	428,000	.340967	.000900	.....	.....	
107,250	429,000	.341867	.000900	.....	.....	
107,500	430,000	.342767	.000900	.....	.....	
107,750	431,000	.343667	.000900	.....	.....	
108,000	432,000	.344567	.000900	.....	.....	
108,250	433,000	.345467	.000900	.....	.....	
108,500	434,000	.346367	.000900	.....	.....	
108,750	435,000	.347267	.000900	.....	.....	
109,000	436,000	.348167	.000900	.....	.....	
109,250	437,000	.349067	.000900	.....	.....	
109,500	438,000	.349967	.000900	.....	.....	
109,750	439,000	.350867	.000900	.....	.....	
110,000	440,000	.351767	.000900	.....	.....	
110,250	441,000	.352667	.000900	.....	.....	
110,500	442,000	.353567	.000900	.....	.....	
110,750	443,000	.354467	.000900	.....	.....	
111,000	444,000	.355367	.000900	.....	.....	
111,250	445,000	.356267	.000900	.....	.....	
111,500	446,000	.357167	.000900	.....	.....	
111,750	447,000	.358067	.000900	.....	.....	
112,000	448,000	.358967	.000900	.....	.....	
112,250	449,000	.359867	.000900	.....	.....	
112,500	450,000	.360767	.000900	.....	.....	
112,750	451,000	.361667	.000900	.....	.....	
113,000	452,000	.362567	.000900	.....	.....	
113,250	453,000	.363467	.000900	.....	.....	
113,500	454,000	.364367	.000900	.....	.....	
113,750	455,000	.365267	.000900	.....	.....	
114,000	456,000	.366167	.000900	.....	.....	
114,250	457,000	.367067	.000900	.....	.....	
114,500	458,000	.367967	.000900	.....	.....	
114,750	459,000	.368867	.000900	.....	.....	
115,000	460,000	.369767	.000900	.....	.....	
115,250	461,000	.370667	.000900	.....	.....	
115,500	462,000	.371567	.000900	.....	.....	
115,750	463,000	.372467	.000900	.....	.....	
116,000	464,000	.373367	.000900	.....	.....	
116,250	465,000	.374267	.000900	.....	.....	
116,500	466,000	.375167	.000900	.....	.....	
116,750	467,000	.376067	.000900	.....	.....	
117,000	468,000	.376967	.000900	.....	.....	
117,250	469,000	.377867	.000900	.....	.....	
117,500	470,000	.378767	.000900	.....	.....	
117,750	471,000	.379667	.000900	.....	.....	
118,000	472,000	.380567	.000900	.....	.....	
118,250	473,000	.381467	.000900	.....	.....	
118,500	474,000	.382367	.000900	.....	.....	
118,750	475,000	.383267	.000900	.....	.....	
119,000	476,000	.384167	.000900	.....	.....	
119,250	477,000	.385067	.000900	.....	.....	
119,500	478,000	.385967	.000900	.....	.....	
119,750	479,000	.386867	.000900	.....	.....	
120,000	480,000	.387767	.000900	.....	.....	
120,250	481,000	.388667	.000900	.....	.....	
120,500	482,000	.389567	.000900	.....	.....	
120,750	483,000	.390467	.000900	.....	.....	
121,000	484,000	.391367	.000900	.....	.....	
121,250	485,000	.392267	.000900	.....	.....	
121,500	486,000	.393167	.000900	.....	.....	
121,750	487,000	.394067	.000900	.....	.....	
122,000	488,000	.394967	.000900	.....	.....	
122,250	489,000	.395867	.000900	.....	.....	
122,500	490,000	.396767	.000900	.....	.....	
122,750	491,000	.397667	.000900	.....	.....	
123,000	492,000	.398567	.000900	.....	.....	
123,250	493,000	.399467	.000900	.....	.....	
123,500	494,000	.400367	.000900	.....	.....	
123,750	495,000	.401267	.000900	.....	.....	
124,000	496,000	.402167	.000900	.....	.....	
124,250	497,000	.403067	.000900	.....	.....	
124,500	498,000	.403967	.000900	.....	.....	
124,750	499,000	.404867	.000900	.....	.....	
125,000	500,000	.405767	.000900	.....	.....	
125,250	501,000	.406667	.000900	.....	.....	
125,500	502,000	.407567	.000900	.....	.....	
125,750	503,000	.408467	.000900	.....	.....	
126,000	504,000	.409367	.000900	.....	.....	
126,250	505,000	.410267	.000900	.....	.....	
126,500	506,000	.411167	.000900	.....	.....	
126,750	507,000	.412067	.000900	.....	.....	
127,000	508,000	.412967	.000900	.....	.....	
127,250	509,000	.413867	.000900	.....	.....	
127,500	510,000	.414767	.000900	.....	.....	
127,750	511,000	.415667	.000900	.....	.....	
128,000	512,000	.416567	.000900	.....

No. 1025.

Marks, 12″ H & T / T / No. 3
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000300	.000133	0.	.....	
3,750	15,000	.000500	.000200	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001000	.000167	.000033	.000033	
8,750	35,000	.001167	.000167	.000033	0.	
10,000	40,000	.001400	.000233	.000067	.000034	
11,250	45,000	.001600	.000200	.000067	0.	
11,500	46,000	.001633	.000033	.....	.....	
11,750	47,000	.001667	.000034	.....	.....	
12,000	48,000	.001733	.000066	.....	.....	Elastic limit.
12,250	49,000	.001867	.000134	.....	.....	
12,500	50,000	.007833	.005966	.005767	.005700	
12,750	51,000	.008167	.000334	.....	.....	
13,000	52,000	.008667	.000500	.....	.....	
13,250	53,000	.009000	.000333	.....	.....	
13,500	54,000	.009933	.000933	.....	.....	
13,750	55,000	.010700	.000767	.008367	.002600	
14,000	56,000	.011667	.000967	.....	.....	
14,250	57,000	.012367	.000700	.....	.....	
14,500	58,000	.013267	.000900	.....	.....	
14,750	59,000	.014033	.000766	.....	.....	
15,000	60,000	.015367	.001334	.012700	.004333	
15,500	62,000	.017167	.001800	.....	.....	
16,000	64,000	.019000	.001833	.....	.....	
16,500	66,000	.021667	.002667	.....	.....	
17,000	68,000	.024067	.002400	.....	.....	
17,500	70,000	.026732	.002666	.....	.....	
18,000	72,000	.029667	.002934	.....	.....	
18,500	74,000	.032700	.003033	.....	.....	
19,000	76,000	.036333	.003633	.....	.....	
19,500	78,000	.040000	.003667	.....	.....	
20,000	80,000	.044700	.004700	.....	.....	
20,500	82,000	.050000	.005300	.....	.....	
21,000	84,000	.057000	.007000	.....	.....	
21,500	86,000	.064667	.007667	.....	.....	
22,000	88,000	.076333	.011666	.....	.....	
22,500	90,000	.0967	.020367	.....	.....	
23,000	92,000	.1200	.0233	.....	.....	
23,200	92,800	.1500	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,800
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.2200
Elongation per inch under strain at elastic limit	do...	001733
Reduction in diameter at point of rupture	do ..	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture	¼ inch from middle of stem	
Character of broken surface		silky
Elongation of inch sections		″.15, ″.35*, ″.16

No. 549.

Marks, 12″ H & T / T / No. 4
Length, 5″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000650	.000200	0.	.....	
12,500	25,000	.000800	.000150	0.	.....	
15,000	30,000	.000950	.000150	0.	.....	
17,500	35,000	.001100	.000150	0.	.....	
20,000	40,000	.001300	.000200	.000050	.000050	
22,500	45,000	.001400	.000100	.000050	0.	
25,000	50,000	.001700	.000300	.000100	.000050	
25,500	51,000	.001750	.000050	.....	.....	Elastic limit.
26,000	52,000	.005400	.003650	.....	.....	
26,500	53,000	.006400	.001000	.....	.....	
27,000	54,000	.007450	.001050	.....	.....	
27,500	55,000	.008350	.000900	.006200	.006100	
28,000	56,000	.009000	.000650	.....	.....	
28,500	57,000	.009500	.000500	.....	.....	
29,000	58,000	.010400	.000900	.....	.....	
29,500	59,000	.011000	.000600	.....	.....	
30,000	60,000	.011500	.000500	.009250	.003050	
44,850	89,700	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section ..... pounds..
Compression per inch under stress at elastic limit ..... inch..
Ultimate strength per square inch of original section ..... pounds..
Manner of failure ..... triple

No. 550.

Marks, 12" H & T / T / No. 5
Length, 5".
Diameter, ".798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000200	.000100	0.	.....	
7,500	15,000	.000350	.000150	0.	.....	
10,000	20,000	.000500	.000150	0.	.....	
12,500	25,000	.000650	.000150	0.	.....	
15,000	30,000	.000850	.000200	0.	.....	
17,500	35,000	.001000	.000150	0.	.....	
20,000	40,000	.001200	.000200	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
23,000	46,000	.001400	.000050	.....	.....	Elastic limit.
23,500	47,000	.001600	.000200	.....	.....	
24,000	48,000	.004600	.003000	.....	.....	
24,500	49,000	.005600	.001000	.....	.....	
25,000	50,000	.006100	.000500	.004350	.004350	
25,500	51,000	.006700	.000600	.....	.....	
26,000	52,000	.007150	.000450	.....	.....	
26,500	53,000	.007650	.000500	.....	.....	
27,000	54,000	.008300	.000650	.....	.....	
27,500	55,000	.009150	.000850	.007150	.002800	
28,000	56,000	.009800	.000650	.....	.....	
28,500	57,000	.010400	.000600	.....	.....	
29,000	58,000	.011250	.000850	.....	.....	
29,500	59,000	.011850	.000600	.....	.....	
30,000	60,000	.012700	.000850	.010400	.003250	
42,280	84,560	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001400
Ultimate strength per square inch of original section	pounds..	84,560
Manner of failure		triple flexure

No. 551.

Marks, 12″ H & T / T / No. 6
Length, 5″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000250	.000150	0.	.....	
7,500	15,000	.000400	.000150	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000750	.000200	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001150	.000250	0.	.....	
20,000	40,000	.001200	.000050	.000050	.000050	
22,500	45,000	.001500	.000300	.000100	.000050	
23,000	46,000	.001600	.000100	.....	.....	Elastic limit.
23,500	47,000	.001950	.000350	.....	.....	
24,000	48,000	.006100	.001150	.....	.....	
24,500	49,000	.006300	.000200	.....	.....	
25,000	50,000	.006800	.000500	.005100	.005000	
25,500	51,000	.007250	.000450	.....	.....	
26,000	52,000	.007750	.000500	.....	.....	
26,500	53,000	.008400	.000650	.....	.....	
27,000	54,000	.009000	.000600	.....	.....	
27,500	55,000	.009750	.000750	.007750	.002650	
28,000	56,000	.010250	.000500	.....	.....	
28,500	57,000	.010900	.000650	.....	.....	
29,000	58,000	.011650	.000750	.....	.....	
29,500	59,000	.012450	.000800	.....	.....	
30,000	60,000	.013150	.000700	.011000	.003250	
42,320	84,640	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001600
Ultimate strength per square inch of original section	pounds..	84,640
Manner of failure		triple flexure

No. 552.

Marks, 12″ H & T / T / No. 7
Length, 3″.22.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001150	.000250	0.	.....	
20,000	40,000	.001200	.000050	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
23,000	46,000	.001450	.000100	.....	.....	
23,500	47,000	.001450	0.	.....	.....	
24,000	48,000	.001500	.000050	.....	.....	
24,500	49,000	.001500	0.	.....	.....	
25,000	50,000	.001550	.000050	0.	.....	Elastic limit
25,500	51,000	.006000	.004450	.....	.....	
26,000	52,000	.006950	.000950	.....	.....	
26,500	53,000	.007450	.000500	.....	.....	
27,000	54,000	.008050	.000600	.....	.....	
27,500	55,000	.008750	.000700	.006650	.006650	
28,000	56,000	.009250	.000500	.....	.....	
28,500	57,000	.009850	.000600	.....	.....	
29,000	58,000	.010500	.000650	.....	.....	
29,500	59,000	.011200	.000700	.....	.....	
30,000	60,000	.012000	.000800	.010150	.003500	
65,000	130,000	.....	.....	.....	.....	Total load applied. Caused triple flexure and shortened specimen 1″.22.

No. 553.

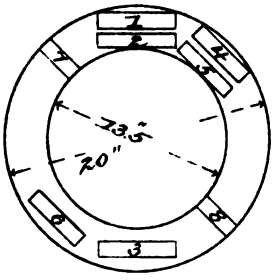
Marks, $\frac{12''\ H\ \&\ T}{T}$
No. 8
Length, 3″.22.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.0002 0	.000150	0.	.....	
7,500	15,000	.000400	.000150	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000700	.000150	0.	.....	
15,000	30,000	.000850	.000150	0.	.....	
17,500	35,000	.001150	.000300	0.	.....	
20,000	40,000	.001250	.000100	0.	.....	
22,500	45,000	.001500	.000250	0.	.....	
23,000	46,000	.001550	.000050	.....	.....	
23,500	47,000	.001600	.000050	.....	.....	
24,000	48,000	.001700	.000100	.....	.....	
24,500	49,000	.001750	.000050	.....	.....	
25,000	50,000	.001850	.000100	.000050	.000050	Elastic limit.
25,500	51,000	.005750	.003900	.....	.....	
26,000	52,000	.006550	.000800	.....	.....	
26,500	53,000	.007300	.000750	.....	.....	
27,000	54,000	.007800	.000500	.....	.....	
27,500	55,000	.008750	.000950	.007000	.006950	
28,000	56,000	.009300	.000550	.....	.....	
28,500	57,000	.009800	.000500	.....	.....	
29,000	58,000	.010700	.000900	.....	.....	
29,500	59,000	.011250	.000550	.....	.....	
30,000	60,000	.012150	.000900	.009700	.002700	
65,000	130,000	.....	.....	.....	.....	Total load applied. Caused triple fle and shortened s men 1″.32.

12" Cast Iron B.L. Rifle, hooped and tubed with steel.

Experimental cylinder. Tube section.

Test ring B



Experimental section

A Original test ring before hooping

B 1st test ring after unhooping

C 2nd " " " "

H Ex 31 49 2

No. 1023.

Marks, $\frac{12\ H\ \&\ T}{T}$ No. 1
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000500	.000167	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000867	.000200	.000033	.000033	
7,500	30,000	.001033	.000166	.000033	0.	
8,750	35,000	.001200	.000167	.000033	0.	
10,000	40,000	.001367	.000167	.000067	.000034	
11,250	45,000	.001533	.000166	.000100	.000033	
12,500	50,000	.001700	.000167	.000133	.000033	
12,750	51,000	.001733	.000033	.....	.....	
13,000	52,000	.001767	.000034	.....	.....	Elastic limit.
13,250	53,000	.001867	.000100	.....	.....	
13,500	54,000	.003333	.001466	.....	.....	
13,750	55,000	.009333	.006000	.007000	.006867	
14,000	56,000	.009667	.000334	.....	.....	
14,250	57,000	.010333	.000666	.....	.....	
14,500	58,000	.010667	.000334	.....	.....	
14,750	59,000	.011233	.000566	.....	.....	
15,000	60,000	.011933	.000700	.009433	.002433	
15,500	62,000	.013433	.001500	.....	.....	
16,000	64,000	.015100	.001667	.....	.....	
16,500	66,000	.017000	.001900	.....	.....	
17,000	68,000	.019167	.002167	.....	.....	
17,500	70,000	.021667	.002500	.....	.....	
18,000	72,000	.024233	.002566	.....	.....	
18,500	74,000	.026667	.002434	.....	.....	
19,000	76,000	.028933	.002266	.....	.....	
19,500	78,000	.032167	.003234	.....	.....	
20,000	80,000	.035267	.003100	.....	.....	
20,500	82,000	.039100	.003833	.....	.....	
21,000	84,000	.043333	.004233	.....	.....	
21,500	86,000	.048433	.005100	.....	.....	
22,000	88,000	.054667	.006234	.....	.....	
22,500	90,000	.062167	.007500	.....	.....	
23,000	92,000	.0733	.011133	.....	.....	
23,500	94,000	.0933	.0200	.....	.....	
24,000	96,000	.1267	.0334	.....	.....	
24,100	96,400	.1500	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,400
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.2033
Elongation per inch under strain at elastic limit	do...	.001767
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		1".2 from neck
Character of broken surface		silky
Elongation of inch sections		".26*, ".24, ".11

No. 1024.

Marks, 12″ H & T / T / No. 2

Diameter, ″.564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	.....	.....	
2,500	10,000	.000333	.000166	.....	.....	
3,750	15,000	.000500	.000167	.....	.....	
5,000	20,000	.000667	.000167	.....	.....	
6,250	25,000	.000833	.000166	.....	.....	
7,500	30,000	.001033	.000200	.000033	.000033	
8,750	35,000	.001167	.000134	.000033	0.	
10,000	40,000	.001333	.000166	.000067	.000034	
11,250	45,000	.001533	.000200	.....	.....	
11,500	46,000	.001567	.000034	.....	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	Elastic limit.
12,250	49,000	.003667	.002034	.....	.....	
12,500	50,000	.006767	.003100	.004767	.004700	
12,750	51,000	.007100	.000333	.....	.....	
13,000	52,000	.007600	.000500	.....	.....	
13,250	53,000	.008100	.000500	.....	.....	
13,500	54,000	.009200	.001100	.....	.....	
13,750	55,000	.009767	.000567	.007467	.002700	
14,000	56,000	.010667	.000900	.....	.....	
14,250	57,000	.011367	.000700	.....	.....	
14,500	58,000	.012233	.000866	.....	.....	
14,750	59,000	.013067	.000834	.....	.....	
15,000	60,000	.013967	.000900	.011467	.004000	
15,500	62,000	.015733	.001766	.....	.....	
16,000	64,000	.017833	.002100	.....	.....	
16,500	66,000	.020033	.002200	.....	.....	
17,000	68,000	.022667	.002634	.....	.....	
17,500	70,000	.025067	.002400	.....	.....	
18,000	72,000	.027533	.002466	.....	.....	
18,500	74,000	.030433	.002900	.....	.....	
19,000	76,000	.033733	.003300	.....	.....	
19,500	78,000	.037400	.003667	.....	.....	
20,000	80,000	.041867	.004467	.....	.....	
20,500	82,000	.047067	.005200	.....	.....	
21,000	84,000	.052667	.005600	.....	.....	
21,500	86,000	.059300	.006633	.....	.....	
22,000	88,000	.0700	.0107	.....	.....	
22,500	90,000	.0867	.0167	.....	.....	
22,950	91,800	.....	.....	.....	.....	Tensile strength.

General summary.

Specific gravity.....

Hardness.....

Tensile strength per square inch of original section.....pounds..

Elastic limit per square inch of original section.....do...

Elongation per inch after rupture.....inch..

Elongation per inch under strain at elastic limit.....do...

Reduction in diameter at point of rupture.....do...

Reduction in area after rupture, per centum of original section.....

Position of rupture.....$\frac{3}{8}$ inch from middle

Character of broken surface.....granular; fractured at defective spot in th

Elongation of inch sections.....″.10, ″

No. 1025.

Marks, 12" H & T / T / No. 3

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000300	.000133	0.	.....	
3,750	15,000	.000500	.000200	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001000	.000167	.000033	.000033	
8,750	35,000	.001167	.000167	.000033	0.	
10,000	40,000	.001400	.000233	.000067	.000034	
11,250	45,000	.001600	.000200	.000067	0.	
11,500	46,000	.001633	.000033	.....	.....	
11,750	47,000	.001667	.000034	.....	.....	
12,000	48,000	.001733	.000066	.....	.....	Elastic limit.
12,250	49,000	.001867	.000134	.....	.....	
12,500	50,000	.007833	.005966	.005767	.005700	
12,750	51,000	.008167	.000334	.....	.....	
13,000	52,000	.008667	.000500	.....	.....	
13,250	53,000	.009000	.000333	.....	.....	
13,500	54,000	.009933	.000933	.....	.....	
13,750	55,000	.010700	.000767	.008367	.002600	
14,000	56,000	.011667	.000967	.....	.....	
14,250	57,000	.012367	.000700	.....	.....	
14,500	58,000	.013267	.000900	.....	.....	
14,750	59,000	.014033	.000766	.....	.....	
15,000	60,000	.015367	.001334	.012700	.004333	
15,500	62,000	.017167	.001800	.....	.....	
16,000	64,000	.019000	.001833	.....	.....	
16,500	66,000	.021667	.002667	.....	.....	
17,000	68,000	.024067	.002400	.....	.....	
17,500	70,000	.026732	.002666	.....	.....	
18,000	72,000	.029667	.002934	.....	.....	
18,500	74,000	.032700	.003033	.....	.....	
19,000	76,000	.036333	.003633	.....	.....	
19,500	78,000	.040000	.003667	.....	.....	
20,000	80,000	.044700	.004700	.....	.....	
20,500	82,000	.050000	.005300	.....	.....	
21,000	84,000	.057000	.007000	.....	.....	
21,500	86,000	.064667	.007667	.....	.....	
22,000	88,000	.076333	.011666	.....	.....	
22,500	90,000	.0967	.020367	.....	.....	
23,000	92,000	.1200	.0233	.....	.....	
23,200	92,800	.1500	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,800
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.2200
Elongation per inch under strain at elastic limit	do...	001733
Reduction in diameter at point of rupture	do ..	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture	¼ inch from middle of stem	
Character of broken surface		silky
Elongation of inch sections		".15, ".35*, ".16

No. 549.

Marks, 12″ H & T / T / No. 4
Length, 5″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000650	.000200	0.	.....	
12,500	25,000	.000800	.000150	0.	.....	
15,000	30,000	.000950	.000150	0.	.....	
17,500	35,000	.001100	.000150	0.	.....	
20,000	40,000	.001300	.000200	.000050	.000050	
22,500	45,000	.001400	.000100	.000050	0.	
25,000	50,000	.001700	.000300	.000100	.000050	
25,500	51,000	.001750	.000050	.....	.....	Elastic limit.
26,000	52,000	.005400	.003650	.....	.....	
26,500	53,000	.006400	.001000	.....	.....	
27,000	54,000	.007450	.001050	.....	.....	
27,500	55,000	.008350	.000900	.006200	.006100	
28,000	56,000	.009000	.000650	.....	.....	
28,500	57,000	.009500	.000500	.....	.....	
29,000	58,000	.010400	.000900	.....	.....	
29,500	59,000	.011000	.000600	.....	.....	
30,000	60,000	.011500	.000500	.009250	.003050	
44,850	89,700	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section .....pounds..
Compression per inch under stress at elastic limit .....inch..
Ultimate strength per square inch of original section .....pounds..
Manner of failure .....triple

No. 550.

Marks, 12" H & T / T / No. 5
Length, 5".
Diameter, ".798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000200	.000100	0.	.....	
7,500	15,000	.000350	.000150	0.	.....	
10,000	20,000	.000500	.000150	0.	.....	
12,500	25,000	.000650	.000150	0.	.....	
15,000	30,000	.000850	.000200	0.	.....	
17,500	35,000	.001000	.000150	0.	.....	
20,000	40,000	.001200	.000200	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
23,000	46,000	.001400	.000050	.....	.....	Elastic limit.
23,500	47,000	.001600	.000200	.....	.....	
24,000	48,000	.004600	.003000	.....	.....	
24,500	49,000	.005600	.001000	.....	.....	
25,000	50,000	.006100	.000500	.004350	.004350	
25,500	51,000	.006700	.000600	.....	.....	
26,000	52,000	.007150	.000450	.....	.....	
26,500	53,000	.007650	.000500	.....	.....	
27,000	54,000	.008300	.000650	.....	.....	
27,500	55,000	.009150	.000850	.007150	.002800	
28,000	56,000	.009800	.000650	.....	.....	
28,500	57,000	.010400	.000600	.....	.....	
29,000	58,000	.011250	.000850	.....	.....	
29,500	59,000	.011850	.000600	.....	.....	
30,000	60,000	.012700	.000850	.010400	.003250	
42,280	84,560	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001400
Ultimate strength per square inch of original section	pounds..	84,560
Manner of failure		triple flexure

No. 551.

Marks, 12″ H & T / T / No. 6
Length, 5″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000250	.000150	0.	.....	
7,500	15,000	.000400	.000150	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000750	.000200	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001150	.000250	0.	.....	
20,000	40,000	.001200	.000050	.000050	.000050	
22,500	45,000	.001500	.000300	.000100	.000050	
23,000	46,000	.001600	.000100	.....	.....	Elastic limit.
23,500	47,000	.001950	.003350	.....	.....	
24,000	48,000	.006100	.001150	.....	.....	
24,500	49,000	.006300	.000200	.....	.....	
25,000	50,000	.006800	.000500	.005100	.005000	
25,500	51,000	.007250	.000450	.....	.....	
26,000	52,000	.007750	.000500	.....	.....	
26,500	53,000	.008400	.000650	.....	.....	
27,000	54,000	.009000	.000600	.....	.....	
27,500	55,000	.009750	.000750	.007750	.002650	
28,000	56,000	.010250	.000500	.....	.....	
28,500	57,000	.010900	.000650	.....	.....	
29,000	58,000	.011650	.000750	.....	.....	
29,500	59,000	.012450	.000800	.....	.....	
30,000	60,000	.013150	.000700	.011000	.003250	
42,320	84,640	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001600
Ultimate strength per square inch of original section	pounds..	84,640
Manner of failure		triple flexure

No. 552.

Marks, 12″ H & T / T / No. 7
Length, 3″.22.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001150	.000250	0.	.....	
20,000	40,000	.001200	.000050	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
23,000	46,000	.001450	.000100	.....	.....	
23,500	47,000	.001450	0.	.....	.....	
24,000	48,000	.001500	.000050	.....	.....	
24,500	49,000	.001500	0.	.....	.....	
25,000	50,000	.001550	.000050	0.	.....	Elastic limit.
25,500	51,000	.006000	.004450	.....	.....	
26,000	52,000	.006950	.000950	.....	.....	
26,500	53,000	.007450	.000500	.....	.....	
27,000	54,000	.008050	.000600	.....	.....	
27,500	55,000	.008750	.000700	.006650	.006650	
28,000	56,000	.009250	.000500	.....	.....	
28,500	57,000	.009850	.000600	.....	.....	
29,000	58,000	.010500	.000650	.....	.....	
29,500	59,000	.011200	.000700	.....	.....	
30,000	60,000	.012000	.000800	.010150	.003500	
65,000	130,000	.....	.....	.....	.....	Total load applied. Caused triple flexure and shortened specimen 1″.22.

No. 553.

Marks, 12″ H & T / T / No. 8
Length, 3″.22.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.0002 0	.000150	0.	.....	
7,500	15,000	.000400	.000150	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000700	.000150	0.	.....	
15,000	30,000	.000850	.000150	0.	.....	
17,500	35,000	.001150	.000300	0.	.....	
20,000	40,000	.001250	.000100	0.	.....	
22,500	45,000	.001500	.000250	0.	.....	
23,000	46,000	.001550	.000050	.....	.....	
23,500	47,000	.001600	.000050	.....	.....	
24,000	48,000	.001700	.000100	.....	.....	
24,500	49,000	.001750	.000050	.....	.....	
25,000	50,000	.001850	.000100	.000050	.000050	Elastic limit.
25,500	51,000	.005750	.003900	.....	.....	
26,000	52,000	.006550	.000800	.....	.....	
26,500	53,000	.007300	.000750	.....	.....	
27,000	54,000	.007800	.000500	.....	.....	
27,500	55,000	.008750	.000950	.007000	.006950	
28,000	56,000	.009300	.000550	.....	.....	
28,500	57,000	.009800	.000500	.....	.....	
29,000	58,000	.010700	.000900	.....	.....	
29,500	59,000	.011250	.000550	.....	.....	
30,000	60,000	.012150	.000900	.00970 0	.002700	
65,000	130,000	.....	.....	.....	.....	Total load applied. Caused triple fle and shortened s men 1″.32.

No. 1681.

Marks, $\frac{C}{T}$ 2
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000467	.000134	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000767	.000134	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001300	.000200	0.	.....	
11,250	45,000	.001467	.000167	0.	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001567	.000067	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	Elastic limit.
12,500	50,000	.006233	.004566	.001267	.001267	
12,750	51,000	.006867	.000634	.....	.....	
13,000	52,000	.007367	.000500	.....	.....	
13,250	53,000	.007733	.000366	.....	.....	
13,500	54,000	.008500	.000767	.....	.....	
13,750	55,000	.009200	.000700	.006967	.002700	
14,000	56,000	.010167	.000967	.....	.....	
14,250	57,000	.010633	.000466	.....	.....	
14,500	58,000	.011067	.000434	.....	.....	
14,750	59,000	.012100	.001033	.....	.....	
15,000	60,000	.013233	.001133	.....	.....	
15,500	62,000	.015033	.001800	.....	.....	
16,000	64,000	.016700	.001667	.....	.....	
16,500	66,000	.018667	.001967	.....	.....	
17,000	68,000	.020700	.002033	.....	.....	
17,500	70,000	.023067	.002367	.....	.....	
18,000	72,000	.025700	.002633	.....	.....	
18,500	74,000	.028333	.002633	.....	.....	
19,000	76,000	.031333	.003000	.....	.....	
19,500	78,000	.034733	.003400	.....	.....	
20,000	80,000	.038833	.004100	.....	.....	
20,500	82,000	.043233	.004400	.....	.....	
21,000	84,000	.048500	.005267	.....	.....	
21,600	86,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds..
Elastic limit per square inch of original section ..... do...
Elongation per inch after rupture ..... inch..
Elongation per inch under strain at elastic limit ..... do...
Reduction in diameter at point of rupture ..... do...
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ".65 fr
Character of broken surface ..... granular; with belt of dull-colored metal containi
Elongation of inch sections ..... ".06*, "

No. 1682.

Marks, $\frac{C}{T}$ 3

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000267	.000134	0.	.....	
3,750	15,000	.000400	.000133	0.	.....	
5,000	20,000	.000600	.000200	0.	.....	
6,250	25,000	.000733	.000133	0.	.....	
7,500	30,000	.000867	.000134	0.	.....	
8,750	35,000	.001033	.000166	0.	.....	
10,000	40,000	.001267	.000234	0.	.....	
11,250	45,000	.001467	.000200	0.	.....	
11,500	46,000	.001533	.000066	.....	.....	
11,750	47,000	.001600	.000067	.....	.....	Elastic limit.
12,000	48,000	.001733	.000133	.....	.....	
12,250	49,000	.005733	.004000	.....	.....	
12,500	50,000	.006667	.000934	.004767	.004767	
12,750	51,000	.007167	.000500	.....	.....	
13,000	52,000	.007733	.000566	.....	.....	
13,250	53,000	.008167	.000434	.....	.....	
13,500	54,000	.009000	.000833	.....	.....	
13,750	55,000	.010033	.001033	.007733	.002966	
14,000	56,000	.010567	.000534	.....	.....	
14,250	57,000	.010900	.000333	.....	.....	
14,500	58,000	.011733	.000833	.....	.....	
14,750	59,000	.012500	.000767	.....	.....	
15,000	60,000	.013633	.001133	.....	.....	
15,500	62,000	.015367	.001734	.....	.....	
16,000	64,000	.017333	.001966	.....	.....	
16,500	66,000	.019333	.002000	.....	.....	
17,000	68,000	.021467	.002134	.....	.....	
17,500	70,000	.023733	.002266	.....	.....	
18,000	72,000	.026300	.002567	.....	.....	
18,500	74,000	.028833	.002533	.....	.....	
19,000	76,000	.032333	.003500	.....	.....	
19,500	78,000	.035267	.002934	.....	.....	
20,000	80,000	.039333	.004066	.....	.....	
20,500	82,000	.044000	.004667	.....	.....	
21,000	84,000	.049500	.005500	.....	.....	
21,500	86,000	.0567	.0072	.....	.....	
22,000	88,000	.0667	.0100	.....	.....	
22,500	90,000	.0733	.0066	.....	.....	
23,000	92,000	.0933	.0200	.....	.....	
23,500	94,000	.1233	.0300	.....	.....	
23,540	94,160	.1433	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,160
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		½ inch from middle of stem
Character of broken surface		fine granular and silky
Elongation of inch sections		".16, ".33*, ".14

TABULATION OF TENSION SPECIMENS FROM 12-INCH CAST-IRON RIFLE, HOOPED AND TUBED WITH STEEL.

EXPERIMENTAL SECTION.

No. of test.	Position in gun.	Location of specimen.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.	Specific gravity.	Hardness.	Remarks.
			Pounds.	*Pounds.*	*Pr.ct.*	*Pr.ct.*				
1119	Cast-iron body	Inside		29,000			Granular			
1120	do	do		26,760			do			
1121	do	do		28,720			do			
1122	do	do		28,760			do			
2270	do	do		24,880			Granular; mottled			
2271	do	do		27,450			do			
1013	Steel hoop Ax	Outside	53,000	103,240	13.7	39.2	Granular; silky center			
1014	do	Inside	53,000	105,080	14.7	36.4	do	7.8535	22.39	
1015	do	Middle	53,000	105,280	14.7	36.4	do			
1016	do	do	53,000	104,680	13.3	39.2	Silky			
1017	Steel hoop Bx	Outside	52,000	103,520	14.3	39.2	Silky, with granular metal			
1018	do	Inside	53,000	104,600	15.8	36.4	Granular; dull center	7.8543	22.14	
1019	do	Middle	48,000	102,000	15.5	36.4	Silky; ring of granular metal			
1020	do	do	49,000	100,400	15.7	39.2	Granular; silky center			
1023	Tube	Outside	52,000	96,400	20.3	39.2	Silky			Whitworth steel.
1024	do	Inside	48,000	91,800	10.3	11.8	Granular; defective spot	7.8667	16.31	Do.
1025	do	Middle	48,000	92,800	22.0	41.9	Silky			Do.
1680	do	Outside	54,000	95,560	20.3	41.9	Silky; slightly granular			Do.
1681	do	Inside	49,000	86,400	5.0	11.8	Granular belt of dull-colored metal			Do.
1682	do	Middle	47,000	94,160	21.0	39.2	Fine granular and silky			

TABULATION OF COMPRESSION SPECIMENS FROM 12-INCH CAST-IRON RIFLE, HOOPED AND TUBED WITH STEEL.

EXPERIMENTAL SECTION.

No. of test.	Position in gun.	Location of specimen.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.	Remarks.
			Pounds.	*Pounds.*		
544	Cast-iron body.	Outside.	.....	51,450	Triple flexure.	
545	....do	Middle..	.....	49,900	....do	
546	....do	...do	.....	51,100	.. do	
547	....do	Radial ..	.....	64,300	....do	
548	....do	...do	.....	66,900	....do	
549	Tube..... ..	Outside.	51,000	89,700	...do	Whitworth steel.
550	....do	Inside ..	46,000	81,550	...do	Do.
551	....do	Middle..	46,000	84,640	....do	Do.
552	....do	Radial .	50,000	Not defined.	.....	130,000 lbs. per square inch caused triple flexure, and shortened specimen 1".22.
553	....do	...do	50,000	...do	.....	130,000 lbs. per square inch caused triple flexure, and shortened specimen 1".32.

12-INCH CAST-IRON B. L. RIFLE,

LINED WITH WIRE-WRAPPED STEEL TUBE.

CAST-IRON SPECIMENS FROM INITIAL TENSION RINGS A, B, AND C FROM SECOND CASTING, AND INITIAL TENSION RING FROM BREECH OF THIRD CASTING.

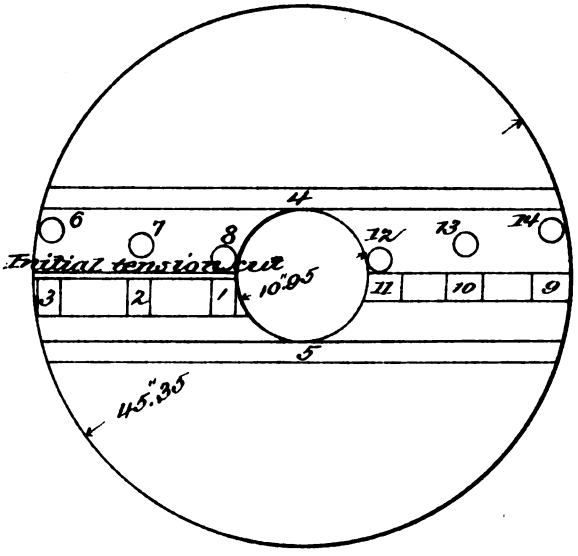
INITIAL TENSION RING A TAKEN 30″ FROM MUZZLE.

INITIAL TENSION RING B TAKEN 0″ FROM MUZZLE.

INITIAL TENSION RING C TAKEN 24″ FROM BREECH OF CASTING AND 4″ IN FRONT OF THE BREECH OF THE FINISHED GUN.

12" Cast Iron B. L. Rifle, lined with wire-wrapped tube.

Initial tension ring A



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12-INCH CAST-IRON B. L. RIFLE, LINED WITH WIRE-WRAPPED STEEL TUBE.

No. 1725.

Marks, $^{12''}_{4}$ A T.
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000100	.000053	.000003	.000003	
4,000	4,000	.000147	.000047	.000007	.000004	
5,000	5,000	.000200	.000053	.000010	.000003	
6,000	6,000	.000250	.000050	.000017	.000007	
7,000	7,000	.000307	.000057	.000020	.000003	
8,000	8,000	.000367	.000060	.000030	.000010	
9,000	9,000	.000420	.000053	.000037	.000007	
10,000	10,000	.000480	.000060	.000043	.000006	
11,000	11,000	.000543	.000063	.000050	.000007	
12,000	12,000	.000603	.000060	.000063	.000013	
13,000	13,000	.000667	.000064	.000077	.000014	
14,000	14,000	.000730	.000063	.000083	.000006	
15,000	15,000	.000810	.000080	.000107	.000024	
16,000	16,000	.000880	.000070	.000123	.000016	
17,000	17,000	.000963	.000083	.000143	.000020	
18,000	18,000	.001047	.000084	.000170	.000027	
19,000	19,000	.001147	.000100	.000207	.000037	
20,000	20,000	.001253	.000106	.000250	.000043	
21,000	21,000	.001390	.000137	.000313	.000063	
22,000	22,000	.001523	.000133	.....	.....	Tensile strength.

Fractured 2¼″ from middle of stem.
Character of broken surface, granular; mottled; resembling granite.
The specimen sustained the maximum load two minutes, then fractured.

No. 1726.

Marks, $\frac{12^{11}\,T}{A\ 5}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Length of stem, 30″.

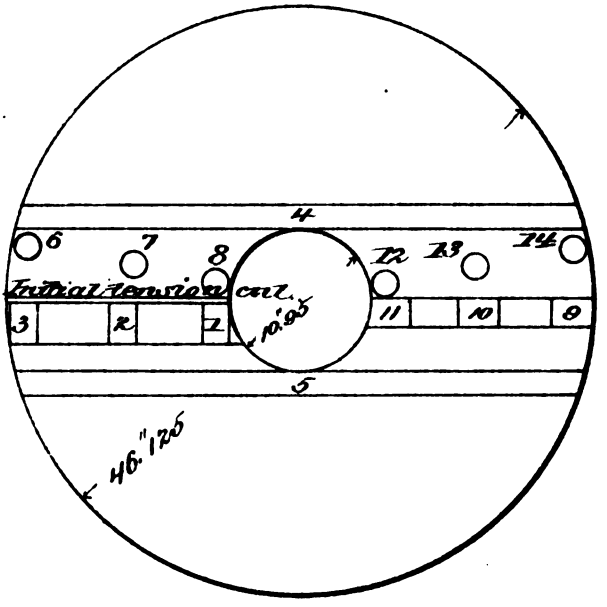
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000100	.000053	0.	.....	
4,000	4,000	.000140	.000040	0.	.....	
5,000	5,000	.000187	.000047	.000003	.000003	
6,000	6,000	.000237	.000050	.000010	.000007	
7,000	7,000	.000290	.000053	.000013	.000003	
8,000	8,000	.000347	.000057	.000017	.000004	
9,000	9,000	.000397	.000050	.000020	.000003	
10,000	10,000	.000453	.000056	.000030	.000010	
11,000	11,000	.000513	.000060	.000037	.000007	
12,000	12,000	.000570	.000057	.000043	.000006	
13,000	13,000	.000637	.000067	.000053	.000010	
14,000	14,000	.000700	.000063	.000067	.000014	
15,000	15,000	.000767	.000067	.000083	.000016	
16,000	16,000	.000847	.000080	.000100	.000017	
17,000	17,000	.000917	.000070	.000117	.000017	
18,000	18,000	.001007	.000090	.000147	.000030	
19,000	19,000	.001097	.000090	.000173	.000026	
20,000	20,000	.001197	.000100	.000203	.000030	
21,000	21,000	.001307	.000110	.000257	.000054	
22,000	22,000	.001430	.000123	.000313	.000056	
25,580	25,580	.....	.....	.....	.....	Tensile strength.

Fractured 4″ from the neck.

Character of broken surface, granular; mottled; resembling granite.

12" Cast Iron B.L. Rifle, lined with wire-wrapped tube.

Initial tension ring B



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No. 1727.

Marks, $\frac{12^{11}\ T}{B\ 4}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000093	.000046	0.	.....	
4,000	4,000	.000140	.000047	0.	.....	
5,000	5,000	.000190	.000050	0.	.....	
6,000	6,000	.000240	.000050	.000007	.000007	
7,000	7,000	.000293	.000053	.000013	.000006	
8,000	8,000	.000347	.000054	.000017	.000004	
9,000	9,000	.000407	.000060	.000020	.000003	
10,000	10,000	.000463	.000056	.000027	.000007	
11,000	11,000	.000523	.000060	.000033	.000006	
12,000	12,000	.000580	.000057	.000043	.000010	
13,000	13,000	.000647	.000067	.000060	.000017	
14,000	14,000	.000720	.000073	.000073	.000013	
15,000	15,000	.000790	.000070	.000090	.000017	
16,000	16,000	.000863	.000073	.000107	.000017	
17,000	17,000	.000947	.000084	.000127	.000020	
18,000	18,000	.001033	.000086	.000150	.000033	
19,000	19,000	.001130	.000097	.000183	.000033	
20,000	20,000	.001240	.000110	.000230	.000047	
21,000	21,000	.001363	.000123	.000290	.000060	
22,000	22,000	.001499	.000127	.000350	.000060	
24,960	24,960	.....	.....	.....	.....	Tensile strength.

Fractured 2¼″ from the middle of the stem.

Character of broken surface, granular; mottled; resembling granite.

No. 1728.

Marks, $\frac{12''\ T}{B\ 5}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000090	.000043	0.	.....	
4,000	4,000	.000137	.000047	0.	.....	
5,000	5,000	.000190	.000053	.000003	.000003	
6,000	6,000	.000240	.000050	.000003	0.	
7,000	7,000	.000287	.000047	.000007	.000004	
8,000	8,000	.000347	.000060	.000013	.000006	
9,000	9,000	.000397	.000050	.000020	.000007	
10,000	10,000	.000450	.000053	.000027	.000007	
11,000	11,000	.000510	.000060	.000033	.000006	
12,000	12,000	.000573	.000063	.000043	.000010	
13,000	13,000	.000637	.000064	.000053	.000010	
14,000	14,000	.000703	.000066	.000063	.000010	
15,000	15,000	.000773	.000070	.000080	.000017	
16,000	16,000	.000847	.000074	.000100	.000020	
17,000	17,000	.000933	.000086	.000123	.000023	
18,000	18,000	.001017	.000084	.000150	.000017	
19,000	19,000	.001103	.000086	.000180	.000030	
20,000	20,000	.001217	.000114	.000217	.000037	
21,000	21,000	.001323	.000106	.000267	.000050	
22,000	22,000	.001460	.000137	.000333	.000066	
23,550	23,550	.....	.....	.....	.....	Tensile strength.

Fractured 3″ from the middle of the stem.
Character of broken surface, granular; mottled; resembling granite.

Marks, 12″ T.

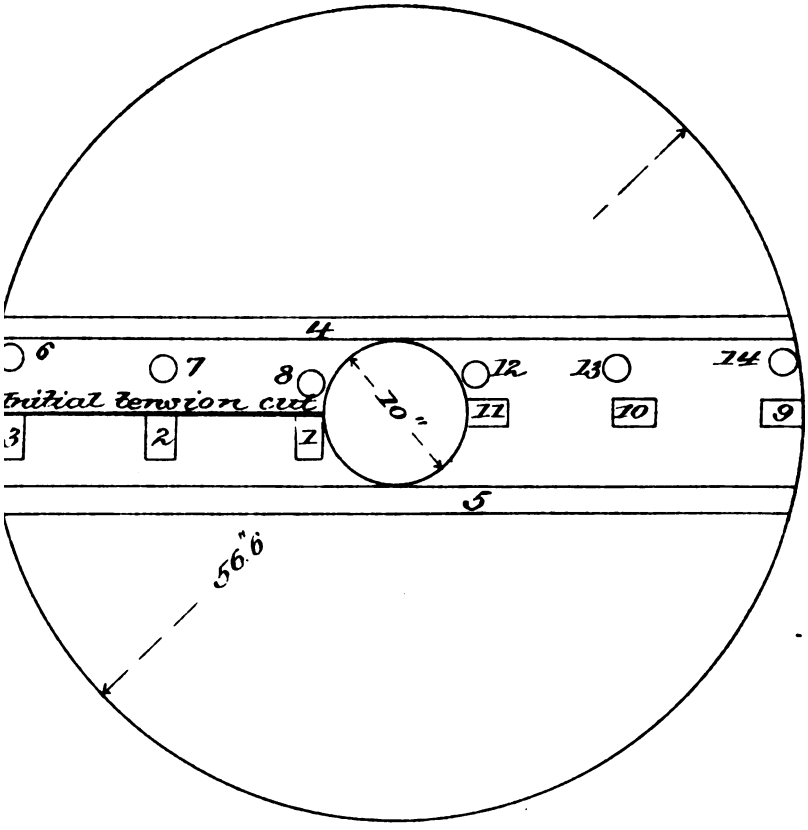
No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength. Total.	Tensile strength. Per square inch.	
		Inches.	*Sq. inch.*	*Pounds.*	*Pounds.*	
708	A 1	1.129	1.00	29,820	29,820	Specific gravity, 7.3210; hardness, 17.71.
709	A 2	1.129	1.00	29,410	29,410	
710	A 3	1.129	1.00	33,180	33,180	
1710	A 6	1.129	1.00	34,820	34,820	
1711	A 7	1.129	1.00	28,400	28,400	Specific gravity, 6.6609 ?
1712	A 8	1.129	1.00	31,350	31,350	Specific gravity, 7.3607
1713	A 9	1.129	1.00	30,620	30,620	
1714	A 10	1.129	1.00	26,150	26,150	
1715	A 11	1.129	1.00	26,940	26,940	
1716	B 1	1.129	1.00	30,280	30,280	Specific gravity, 7.3260
1717	B 2	1.129	1.00	28,900	28,900	Specific gravity, 7.3094
1718	B 3	1.129	1.00	29,850	29,850	
1719	B 6	1.129	1.00	32,680	32,680	
1720	B 7	1.129	1.00	23,620	23,620	
1721	B 8	1.129	1.00	33,700	33,700	
1722	B 9	1.129	1.00	31,080	31,080	
1723	B 10	1.129	1.00	27,700	27,700	
1724	B 11	1.129	1.00	29,700	29,700	

The appearance of fractures of above specimens were granular; mottled; resembling granite.

Marks.	Location of specimen.	Specific gravity.	Hardness.
A 12	Inside	7.2821	17.90
A 13	Middle	7.3122	20.03
A 14	Outside	7.2761	17.53
B 12	Inside	7.3526	19.18
B 13	Middle	7.3012	18.58
B 14	Outside	7.3218	17.53
A	Breech	7.3115	16.90
B	....do	7.2949	16.31
C	At trunnion band	7.3709	20.47
D		7.2091	16.23
E		7.3312	19.18
F	147″ in front of trunnion band.	7.3503	19.81
G		7.3226	18.09
H		7.3423	17.90

72" Cast Iron B. L. Rifle, lined with wire-wrapped tube.

Initial tension ring C



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No. 2268.

Marks, $\frac{12''\ T}{C\ 4}$

Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	0.	.....	
3,000	3,000	.000097	.000047	0.	.....	
4,000	4,000	.000143	.000046	.000003	.000003	
5,000	5,000	.000190	.000047	.000007	.000004	
6,000	6,000	.000240	.000050	.000010	.000003	
7,000	7,000	.000297	.000057	.000013	.000003	
8,000	8,000	.000347	.000050	.000020	.000007	
9,000	9,000	.000400	.000053	.000027	.000007	
10,000	10,000	.000457	.000057	.000037	.000010	
11,000	11,000	.000520	.000063	.000043	.000006	
12,000	12,000	.000580	.000060	.000053	.000010	
13,000	13,000	.000640	.000060	.000063	.000010	
14,000	14,000	.000707	.000067	.000073	.000010	
15,000	15,000	.000767	.000060	.000087	.000014	
16,000	16,000	.000837	.000070	.000100	.000013	
17,000	17,000	.000913	.000076	.000120	.000020	
18,000	18,000	.000990	.000077	.000140	.000020	
19,000	19,000	.001067	.000077	.000167	.000027	
20,000	20,000	.001160	.000093	.000197	.000030	
21,000	21,000	.001267	.000107	.000250	.000053	
22,000	22,000	.001390	.000123	.000300	.000050	
22,200	22,200	.....	.....	.....	.....	Tensile strength.

Fractured 11″ from the neck.
Character of broken surface, granular; mottled.

No. 2269.

Marks, $\frac{12''\ T}{C\ 5}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000093	.000046	0.	.....	
4,000	4,000	.000140	.000047	0.	.....	
5,000	5,000	.000193	.000053	.000007	.000007	
6,000	6,000	.000240	.000047	.000013	.000006	
7,000	7,000	.000293	.000053	.000013	0.	
8,000	8,000	.000347	.000054	.000017	.000004	
9,000	9,000	.000400	.000053	.000023	.000006	
10,000	10,000	.000453	.000053	.000033	.000010	
11,000	11,000	.000513	.000060	.000043	.000010	
12,000	12,000	.000577	.000064	.000053	.000010	
13,000	13,000	.000643	.000066	.000067	.000014	
14,000	14,000	.000703	.000060	.000080	.000013	
15,000	15,000	.000770	.000067	.000090	.000010	
16,000	16,000	.000837	.000067	.000100	.000010	
17,000	17,000	.000907	.000070	.000120	.000020	
18,000	18,000	.000987	.000080	.000143	.000023	
19,000	19,000	.001073	.000086	.000167	.000024	
20,000	20,000	.001163	.000090	.000200	.000033	
21,000	21,000	.001260	.000097	.000237	.000037	
22,000	22,000	.001367	.000107	.000283	.000046	
23,700	23,700	.....	.....	.....	.....	Tensile strength.

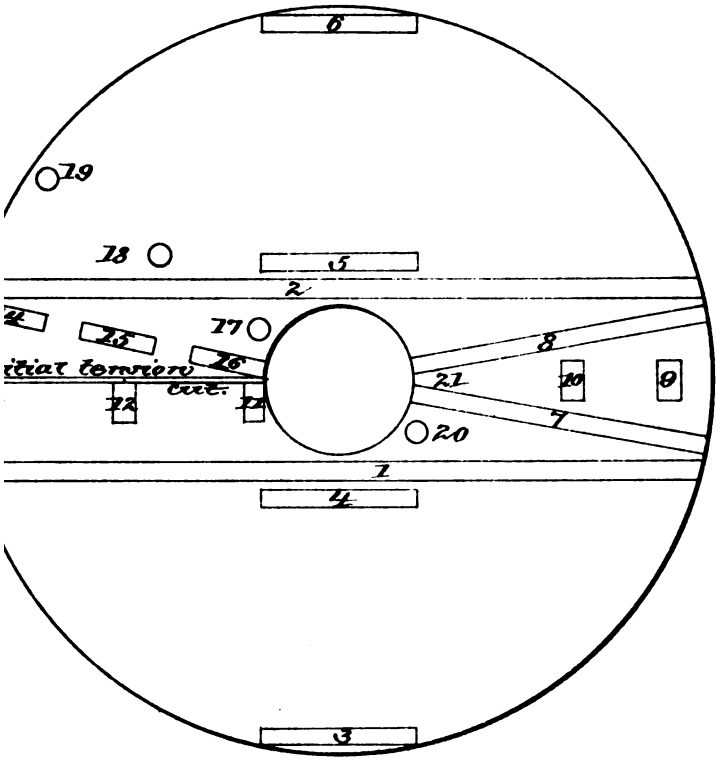
Fractured 11″ from the neck.
Character of broken surface, granular; mottled.

Marks, 12 T C.

No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Per square inch.	
		Inches.	*Sq. inch.*	*Pounds.*	*Pounds.*	
1728	1	1.129	1.00	30,300	30,300	Granular.
1729	2	1.129	1.00	30,800	30,800	Do.
1730	3	1.129	1.00	32,900	32,900	Do.
1731	6	1.129	1.00	33,600	33,600	Do.
1732	7	1.129	1.00	30,700	30,700	Do.
1733	8	1.129	1.00	28,000	28,000	Do.
1734	9	1.129	1.00	30,100	30,100	Do.
1735	10	1.129	1.00	31,900	31,900	Do.
1736	11	1.129	1.00	34,000	34,000	Do.

" Cast Iron B. L. Rifle, lined with wire-wrapped tube.

Initial tension ring 3d casting



H Ex 31 49 2

No. 2820.

Mark, 1.
Diameter, 1".129.
Sectional area, 1 square inch.
Gauged length, 50".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	0.	.....	
3,000	3,000	.000100	.000050	0.	.....	
4,000	4,000	.000152	.000052	.000002	.000002	
5,000	5,000	.000204	.000052	.000008	.000006	
6,000	6,000	.000260	.000056	.000014	.000006	
7,000	7,000	.000314	.000054	.000020	.000006	
8,000	8,000	.000374	.000060	.000026	.000006	
9,000	9,000	.000438	.000064	.000036	.000010	
10,000	10,000	.000502	.000064	.000048	.000012	
11,000	11,000	.000576	.000074	.000064	.000016	
12,000	12,000	.000654	.000078	.000082	.000018	
13,000	13,000	.000732	.000078	.000104	.000022	
14,000	14,000	.000826	.000094	.000134	.000030	
15,000	15,000	.000924	.000098	.000174	.000040	
16,000	16,000	.001040	.000116	.000222	.000048	
17,000	17,000	.001180	.000140	.000296	.000074	
18,000	18,000	.001350	.000170	.000396	.000100	
19,000	19,000	.001560	.000210	.000530	.000134	
19,800	19,800	.....	.....	.....	.....	Tensile strength.

Fractured 8¼" from middle of stem.
Character of broken surface, granular.

No. 2821.

Mark, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 50″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	0.	.....	
3,000	3,000	.000098	.000048	.000002	.000002	
4,000	4,000	.000152	.000054	.000006	.000004	
5,000	5,000	.000202	.000050	.000008	.000002	
6,000	6,000	.000256	.000054	.000010	.000002	
7,000	7,000	.000314	.000058	.000016	.000006	
8,000	8,000	.000370	.000056	.000026	.000010	
9,000	9,000	.000432	.000062	.000036	.000010	
10,000	10,000	.000500	.000068	.000044	.000008	
11,000	11,000	.000574	.000074	.000058	.000014	
12,000	12,000	.000650	.000076	.000080	.000022	
13,000	13,000	.000730	.000080	.000100	.000020	
14,000	14,000	.000824	.000094	.000136	.000036	
15,000	15,000	.000926	.000102	.000170	.000034	
16,000	16,000	.001046	.000120	.000224	.000054	
17,000	17,000	.001176	.000130	.000290	.000066	
18,000	18,000	.001346	.000170	.000390	.000100	
19,000	19,000	.001544	.000198	.000518	.000128	
19,950	19,950	.....	.....	.....	.....	Tensile strength.

Fractured $1\frac{3}{8}$″ from neck.
Character of broken surface, granular.

No. 703.

Mark, 3.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	.000010	.000010	
6,000	6,000	.000240	.000040	.....	.....	
7,000	7,000	.000300	.000060	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000400	.000050	.....	.....	
10,000	10,000	.000450	.000050	.000040	.000030	
11,000	11,000	.000500	.000050	.....	.....	
12,000	12,000	.000550	.000050	.....	.....	
13,000	13,000	.000610	.000060	.....	.....	
14,000	14,000	.000670	.000060	.....	.....	
15,000	15,000	.000710	.000040	.000080	.000040	
16,000	16,000	.000760	.000050	.....	.....	
17,000	17,000	.000830	.000070	.....	.....	
18,000	18,000	.000880	.000050	.....	.....	
19,000	19,000	.000940	.000060	.....	.....	
20,000	20,000	.001000	.000060	.000120	.000040	
21,000	21,000	.001090	.000090	.....	.....	
22,000	22,000	.001140	.000050	.....	.....	
23,000	23,000	.001210	.000070	.....	.....	
24,000	24,000	.001300	.000090	.....	.....	
25,000	25,000	.001380	.000080	.000280	.000160	
26,000	26,000	.001500	.000120	.....	.....	
27,000	27,000	.001600	.000100	.....	.....	
28,000	28,000	.001730	.000130	.....	.....	
29,000	29,000	.001920	.000190	.....	.....	
30,000	30,000	.002120	.000200	.000770	.000490	
31,000	31,000	.002390	.000270	.....	.....	
32,000	32,000	.002750	.000360	.....	.....	
33,000	33,000	.003150	.000400	.....	.....	
34,000	34,000	.003600	.000450	.....	.....	
35,000	35,000	.004200	.000600	.002580	.001810	
36,000	36,000	.004790	.000590	.....	.....	
37,000	37,000	.005520	.000730	.....	.....	
38,000	38,000	.006250	.000730	.....	.....	
44,180	44,180	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 704.

Mark, 4.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000260	.000060	.....	.....	
7,000	7,000	.000310	.000050	.....	.....	
8,000	8,000	.000360	.000050	.....	.....	
9,000	9,000	.000420	.000060	.....	.....	
10,000	10,000	.000480	.000060	.000020	.000020	
11,000	11,000	.000530	.000050	.....	.....	
12,000	12,000	.000590	.000060	.....	.....	
13,000	13,000	.000650	.000060	.....	.....	
14,000	14,000	.000720	.000070	.....	.....	
15,000	15,000	.000780	.000060	.000090	.000070	
16,000	16,000	.000840	.000060	.....	.....	
17,000	17,000	.000900	.000060	.....	.....	
18,000	18,000	.000970	.000070	.....	.....	
19,000	19,000	.001050	.000080	.....	.....	
20,000	20,000	.001130	.000080	.000180	.000090	
21,000	21,000	.001200	.000070	.....	.....	
22,000	22,000	.001290	.000090	.....	.....	
23,000	23,000	.001380	.000090	.....	.....	
24,000	24,000	.001480	.000100	.....	.....	
25,000	25,000	.001570	.000090	.000360	.000180	
26,000	26,000	.001710	.000140	.....	.....	
27,000	27,000	.001840	.000130	.....	.....	
28,000	28,000	.002000	.000160	.....	.....	
29,000	29,000	.002210	.000210	.....	.....	
30,000	30,000	.002440	.000230	.000980	.000620	
31,000	31,000	.002680	.000240	.....	.....	
32,000	32,000	.002970	.000290	.....	.....	
33,000	33,000	.003260	.000290	.....	.....	
34,000	34,000	.003780	.000520	.....	.....	
35,000	35,000	.004220	.000440	.....	.....	
36,000	36,000	.004700	.000480	.....	.....	
37,000	37,000	.005100	.000400	.....	.....	
38,000	38,000	.005620	.000520	.....	.....	
46,300	46,300	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 705.

Mark, 5.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000110	.000050	.....	.....	
4,000	4,000	.000170	.000060	.....	.....	
5,000	5,000	.000220	.000050	.000010	.000010	
6,000	6,000	.000280	.000060	.....	.....	
7,000	7,000	.000340	.000060	.....	.....	
8,000	8,000	.000400	.000060	.....	.....	
9,000	9,000	.000450	.000050	.....	.....	
10,000	10,000	.000510	.000060	.000040	.000030	
11,000	11,000	.000560	.000050	.....	.....	
12,000	12,000	.000610	.000050	.....	.....	
13,000	13,000	.000690	.000080	.....	.....	
14,000	14,000	.000760	.000070	.....	.....	
15,000	15,000	.000810	.000050	.000100	.000060	
16,000	16,000	.000880	.000070	.....	.....	
17,000	17,000	.000960	.000080	.....	.....	
18,000	18,000	.001040	.000080	.....	.....	
19,000	19,000	.001100	.000080	.....	.....	
20,000	20,000	.001170	.000070	.000190	.000090	
21,000	21,000	.001250	.000080	.....	.....	
22,000	22,000	.001330	.000080	.....	.....	
23,000	23,000	.001420	.000090	.....	.....	
24,000	24,000	.001530	.000110	.....	.....	
25,000	25,000	.001640	.000110	.000400	.000210	
26,000	26,000	.001780	.000140	.....	.....	
27,000	27,000	.001920	.000140	.....	.....	
28,000	28,000	.002080	.000160	.....	.....	
29,000	29,000	.002260	.000180	.....	.....	
30,000	30,000	.002580	.000320	.001050	.000650	
31,000	31,000	.002890	.000310	.....	.....	
32,000	32,000	.003200	.000310	.....	.....	
33,000	33,000	.003500	.000300	.....	.....	
34,000	34,000	.003980	.000480	.....	.....	
35,000	35,000	.004650	.000670	.002810	.001760	
36,000	36,000	.005150	.000500	.....	.....	
37,000	37,000	.005550	.000400	.....	.....	
38,000	38,000	.006550	.001000	.....	.....	
44,250	44,250	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 706.

Mark, 6.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1. square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000400	.000050	.....	.....	
10,000	10,000	.000450	.000050	.000020	.000020	
11,000	11,000	.000500	.000050	.....	.....	
12,000	12,000	.000560	.000060	.....	.....	
13,000	13,000	.000610	.000050	.....	.....	
14,000	14,000	.000670	.000060	.....	.....	
15,000	15,000	.000710	.000040	.000060	.000040	
16,000	16,000	.000780	.000070	.....	.....	
17,000	17,000	.000840	.000060	.....	.....	
18,000	18,000	.000900	.000060	.....	.....	
19,000	19,000	.000950	.000050	.....	.....	
20,000	20,000	.001010	.000060	.000120	.000060	
21,000	21,000	.001080	.000070	.....	.....	
22,000	22,000	.001160	.000080	.....	.....	
23,000	23,000	.001240	.000080	.....	.....	
24,000	24,000	.001320	.000080	.....	.....	
25,000	25,000	.001400	.000080	.000260	.000140	
26,000	26,000	.001490	.000090	.....	.....	
27,000	27,000	.001610	.000120	.....	.....	
28,000	28,000	.001760	.000150	.....	.....	
29,000	29,000	.001920	.000160	.....	.....	
30,000	30,000	.002190	.000270	.000790	.000530	
31,000	31,000	.002480	.000290	.....	.....	
32,000	32,000	.002670	.000190	.....	.....	
33,000	33,000	.003190	.000520	.....	.....	
34,000	34,000	.003540	.000350	.....	.....	
35,000	35,000	.004120	.000580	.....	.....	
36,000	36,000	.004800	.000680	.....	.....	
37,000	37,000	.005200	.000400	.....	.....	
38,000	38,000	.006330	.001130	.....	.....	
45,180	45,180	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 707.

Mark, 7.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000110	.000050	.....	.....	
4,000	4,000	.000160	.000050	.....	.....	
5,000	5,000	.000200	.000040	.000010	.000010	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000400	.000050	.....	.....	
10,000	10,000	.000460	.000060	.000020	.000010	
11,000	11,000	.000520	.000060	.....	.....	
12,000	12,000	.000580	.000060	.....	.....	
13,000	13,000	.000630	.000050	.....	.....	
14,000	14,000	.000700	.000070	.....	.....	
15,000	15,000	.000750	.000050	.000080	.000060	
16,000	16,000	.000810	.000060	.....	.....	
17,000	17,000	.000860	.000050	.....	.....	
18,000	18,000	.000920	.000060	.....	.....	
19,000	19,000	.000990	.000070	.....	.....	
20,000	20,000	.001070	.000080	.000150	.000070	
21,000	21,000	.001150	.000080	.....	.....	
22,000	22,000	.001210	.000060	.....	.....	
23,000	23,000	.001300	.000090	.....	.....	
24,000	24,000	.001390	.000090	.....	.....	
25,000	25,000	.001500	.000110	.000330	.000180	
26,000	26,000	.001630	.000130	.....	.....	
27,000	27,000	.001760	.000130	.....	.....	
28,000	28,000	.001900	.000140	.....	.....	
29,000	29,000	.002150	.000250	.....	.....	
30,000	30,000	.002340	.000190	.000530	.000600	
31,000	31,000	.002640	.000300	.....	.....	
32,000	32,000	.002900	.000260	.....	.....	
33,000	33,000	.003300	.000400	.....	.....	
34,000	34,000	.003800	.000500	.....	.....	
35,000	35,000	.004400	.000600	.002690	.001760	
36,000	36,000	.004990	.000590	.....	.....	
37,000	37,000	.005400	.000410	.....	.....	
38,000	38,000	.006250	.000850	.....	.....	
46,820	46,820	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 708.

Mark, 8.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000410	.000060	.....	.....	
10,000	10,000	.000470	.000060	.000020	.000020	
11,000	11,000	.000540	.000070	.....	.....	
12,000	12,000	.000590	.000050	.....	.....	
13,000	13,000	.000650	.000060	.....	.....	
14,000	14,000	.000700	.000050	.....	.....	
15,000	15,000	.000770	.000070	.000090	.000070	
16,000	16,000	.000830	.000060	.....	.....	
17,000	17,000	.000900	.000070	.....	.....	
18,000	18,000	.000970	.000070	.....	.....	
19,000	19,000	.001040	.000070	.....	.....	
20,000	20,000	.001110	.000070	.000170	.000080	
21,000	21,000	.001200	.000090	.....	.....	
22,000	22,000	.001280	.000080	.....	.....	
23,000	23,000	.001380	.000100	.....	.....	
24,000	24,000	.001480	.000100	.....	.....	
25,000	25,000	.001580	.000100	.000390	.000220	
26,000	26,000	.001730	.000150	.....	.....	
27,000	27,000	.001890	.000160	.....	.....	
28,000	28,000	.002070	.000180	.....	.....	
29,000	29,000	.002230	.000160	.....	.....	
30,000	30,000	.002500	.000270	.001050	.000660	
31,000	31,000	.002880	.000380	.....	.....	
32,000	32,000	.003140	.000260	.....	.....	
33,000	33,000	.003500	.000360	.....	.....	
34,000	34,000	.003900	.000400	.....	.....	
35,000	35,000	.004520	.000620	.002800	.001750	
36,000	36,000	.005050	.000530	.....	.....	
37,000	37,000	.005500	.000450	.....	.....	
38,000	38,000	.006300	.000800	.....	.....	
45,680	45,680	.....	.....	.....	.....	Ultimate strength.

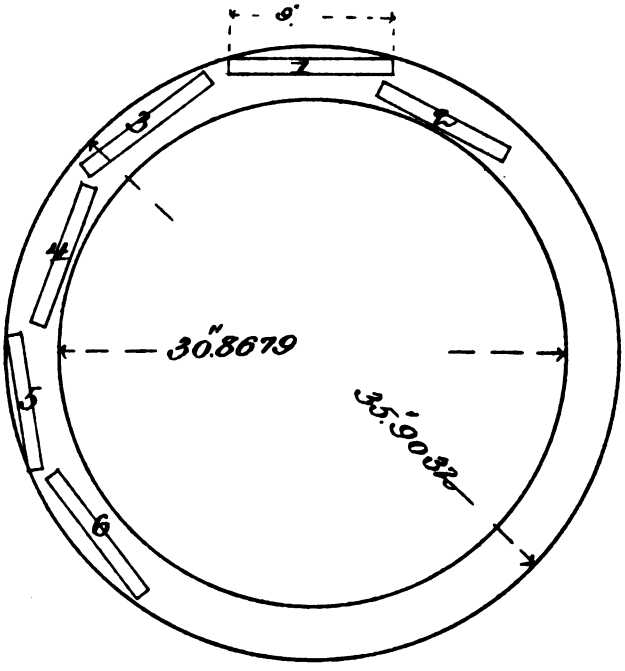
Manner of failure, triple flexure.

Marks, $\frac{12\,C\,I\,R_1\,T\,R}{B\,T}$, &c.

No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Per square inch.	
		Inches.	*Sq. inch.*	*Pounds.*	*Pounds.*	
795	9 O	1.129	1.00	30,050	30,050	Granular.
796	10 M	1.129	1.00	29,280	29,280	Do.
797	14 O	1.129	1.00	26,720	26,720	Do.
.....	14 . .	1.129	1.00	28,210	28,210	Do.
798	15 M	1.129	1.00	28,450	28,450	Do.
799	16 I	1.129	1.00	30,180	30,180	Do.
800	17 I	1.129	1.00	33,560	33,560	Do.
801	18 M	1.129	1.00	28,820	28,820	Do.
802	19 O	1.129	1.00	30,290	30,290	Do.
803	20 I	1.129	1.00	31,650	31,650	Do.
804	21 I	1.129	1.00	30,780	30,780	Do.

2" Cast Iron M.L. Rifled Mortar

Hoop Ax



H Ex 31 492

12-INCH CAST-IRON M. L. RIFLED MORTAR,

EXPERIMENTAL CYLINDER.

STEEL SPECIMENS FROM HOOP Ax AFTER UNHOOPING.

SPECIMEN No. 3 WAS TAKEN OUT AT THE POINT WHERE THE MOLTEN CAST-IRON USED IN UNHOOPING ADHERED TO THE HOOP IN COOLING.

12-INCH CAST-IRON M. L. RIFLED MORTAR.

No. 1123.

rks, 12" M A No. 1
meter, ".564.
ional area, .25 square inch.

Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Inch.	*Inch.*	*Inch.*	*Inch.*	
0.	0.	0.	0.	Initial load.
.000133	.000133	0.	.....	
.000300	.000167	0.	.....	
.000467	.000167	0.	.....	
.000617	.000150	0.	.....	
.000750	.000133	0.	.....	
.000933	.000183	.000017	.000017	
.001083	.000150	.000017	0.	
.001250	.000167	.000017	0.	
.001383	.000133	.000017	0.	
.001417	.000034	.....	.....	
.001450	.000033	.....	.....	
.001500	.000050	.....	.....	
.001567	.000067	.....	.....	
.001600	.000033	.000033	.000016	
.001633	.000033	.....	.....	
.001650	.000017	.....	.....	
.001683	.000033	.....	.....	Elastic limit.
.001800	.000117	.000100	.000067	
.002133	.000333	.....	.....	
.002350	.000217	.....	.....	
.002733	.000383	.....	.....	
.003067	.000334	.....	.....	
.003567	.000500	.001567	.001467	
.004667	.001100	.....	.....	
.005900	.001233	.....	.....	
.007183	.001283	.....	.....	
.008683	.001500	.....	.....	
.010200	.001517	.....	.....	
.011683	.001483	.....	.....	
.013083	.001400	.....	.....	
.014667	.001584	.....	.....	
.016167	.001500	.....	.....	
.017833	.001666	.....	.....	
.019683	.001850	.....	.....	
.021667	.001984	.....	.....	
.023667	.002000	.....	.....	
.025833	.002166	.....	.....	
.028000	.002167	.....	.....	
.030917	.002917	.....	.....	
.033333	.002416	.....	.....	
.0367	.003367	.....	.....	
.0400	.0033	.....	.....	
.0450	.0050	.....	.....	
.0517	.0067	.....	.....	
.0583	.0066	.....	.....	
.0667	.0084	.....	.....	
.0867	.0200	.....	.....	
.1083	.0216	.....	.....	Tensile strength.

General summary.

per square inch of original section	pounds..	108,480
square inch of original section	do...	54,080
inch after rupture	inch..	0.1467
inch under strain at elastic limit	do...	.001683
per inch diameter at point of rupture	do...	.084
in area after rupture, per centum of original section		27.6
of rupture		".90 from middle of stem
of broken surface	granular; dull spot at circumference	
of inch sections		".09, ".17, ".27, ".14, ".12, ".09

No. 1124.

Marks, 12″ M / A / No. 2
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000650	.000167	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.001000	.000183	0.	.....	
8,750	35,000	.001150	.000150	.000017	.000017	
10,000	40,000	.001317	.000167	.000017	0.	
11,250	45,000	.001467	.000150	.000017	0.	
12,500	50,000	.001633	.000166	.000033	.000016	
12,750	51,000	.001667	.000134	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001750	.000017	.....	.....	
13,750	55,000	.001783	.000033	.000033	0.	
14,000	56,000	.001867	.000084	.....	.....	
14,250	57,000	.001917	.000050	.....	.....	
14,500	58,000	.001967	.000050	.....	.....	
14,750	59,000	.002033	.000066	.....	.....	
15,000	60,000	.002067	.000034	.000133	.000100	Elastic limit.
15,250	61,000	.002133	.000066	.....	.....	
15,500	62,000	.002283	.000150	.....	.....	
15,750	63,000	.002500	.000217	.....	.....	
16,000	64,000	.002717	.000217	.....	.....	
16,250	65,000	.002950	.000233	.....	.....	
16,500	66,000	.003533	.000583	.....	.....	
16,750	67,000	.004333	.000800	.....	.....	
17,000	68,000	.004667	.000334	.....	.....	
17,250	69,000	.005333	.000666	.....	.....	
17,500	70,000	.006017	.000684	.....	.....	
18,000	72,000	.007500	.001483	.....	.....	
18,500	74,000	.009050	.001550	.....	.....	
19,000	76,000	.010750	.001700	.....	.....	
19,500	78,000	.012000	.001250	.....	.....	
20,000	80,000	.013583	.001583	.....	.....	
20,500	82,000	.015200	.001617	.....	.....	
21,000	84,000	.017083	.001883	.....	.....	
21,500	86,000	.018750	.001667	.....	.....	
22,000	88,000	.020683	.001933	.....	.....	
22,500	90,000	.022750	.002067	.....	.....	
23,000	92,000	.024667	.001917	.....	.....	
23,500	94,000	.027250	.002583	.....	.....	
24,000	96,000	.029600	.002350	.....	.....	
24,500	98,000	.032500	.002900	.....	.....	
25,000	100,000	.035667	.003167	.....	.....	
25,500	102,000	.039833	.004166	.....	.....	
26,000	104,000	.043533	.003700	.....	.....	
26,500	106,000	.0483	.004767	.....	.....	
27,000	108,000	.0550	.0067	.....	.....	
27,500	110,000	.0650	.0100	.....	.....	
28,000	112,000	.0833	.0183	.....	.....	
28,110	112,440	.0983	.0150	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds..
Elastic limit per square inch of original section ..... do...
Elongation per inch after rupture ..... inch..
Elongation per inch under strain at elastic limit ..... do...
Reduction in diameter at point of rupture ..... do...
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ″.70 fr
Character of broken surface ..... granular; small dull spot at the circum
Elongation of inch sections ..... ″.20*, ″.11, ″.10, ″.08, ″

No. 1125.

Marks, 12″ M / A / No. 3
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000783	.000183	0.	.....	
7,500	30,000	.000933	.000150	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	.000017	.000017	
11,250	45,000	.001433	.000166	.000033	.000016	
12,500	50,000	.001617	.000184	.000033	0.	
12,750	51,000	.001667	.000050	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	Elastic limit.
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001867	.000084	.....	.....	
13,750	55,000	.001967	.000100	.000183	.000150	
14,000	56,000	.002367	.000400	.....	.....	
14,250	57,000	.002633	.000266	.....	.....	
14,500	58,000	.002967	.000334	.....	.....	
14,750	59,000	.003300	.000333	.....	.....	
15,000	60,000	.003917	.000617	.001867	.001684	
15,500	62,000	.004900	.000983	.....	.....	
16,000	64,000	.006167	.001267	.....	.....	
16,500	66,000	.007583	.001416	.....	.....	
17,000	68,000	.008783	.001200	.....	.....	
17,500	70,000	.010517	.001734	.....	.....	
18,000	72,000	.011800	.001283	.....	.....	
18,500	74,000	.013183	.001383	.....	.....	
19,000	76,000	.014867	.001684	.....	.....	
19,500	78,000	.016417	.001550	.....	.....	
20,000	80,000	.018500	.002083	.....	.....	
20,500	82,000	.020250	.001750	.....	.....	
21,000	84,000	.022167	.001917	.....	.....	
21,500	86,000	.023917	.001750	.....	.....	
22,000	88,000	.026017	.002100	.....	.....	
22,500	90,000	.028417	.002400	.....	.....	
23,000	92,000	.030900	.002483	.....	.....	
23,500	94,000	.033667	.002767	.....	.....	
24,000	96,000	.037000	.003333	.....	.....	
24,500	98,000	.040583	.003583	.....	.....	
25,000	100,000	.044833	.004250	.....	.....	
25,500	102,000	.050667	.005834	.....	.....	
26,000	104,000	.0550	.004333	.....	.....	
26,500	106,000	.0560	.0100	.....	.....	
27,000	108,000	.0867	.0217	.....	.....	
27,180	108,720	.1083	.0166	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	108,720
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.1450
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		¼ inch from middle of stem
Character of broken surface		granular; dull spot near circumference
Elongation of inch sections		″.10, ″.11, ″.27, ″.16, ″.12, ″.11

No. 1126.

Marks, 12″ M A No. 4
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000300	.000183	0.	.....	
3,750	15,000	.000433	.000133	0.	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000783	.000183	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001100	.000150	0.	.....	
10,000	40,000	.001250	.000150	0.	.....	
11,250	45,000	.001433	.000183	0.	.....	
12,500	50,000	.001600	.000167	0.	.....	
12,750	51,000	.001617	.000017	.....	.....	
13,000	52,000	.001650	.000033	.....	.....	
13,250	53,000	.001683	.000033	.....	.....	
13,500	54,000	.001717	.000034	.....	.....	
13,750	55,000	.001750	.000033	0.	.....	
14,000	56,000	.001800	.000050	.....	.....	
14,250	57,000	.001867	.000067	.....	.....	
14,500	58,000	.001900	.000033	.....	.....	Elastic limit.
14,750	59,000	.001967	.000067	.....	.....	
15,000	60,000	.002117	.000150	.000200	.000200	
15,500	62,000	.002383	.000266	.....	.....	
16,000	64,000	.002800	.000417	.....	.....	
16,500	66,000	.003733	.000933	.....	.....	
17,000	68,000	.005067	.001334	.....	.....	
17,500	70,000	.006500	.001433	.....	.....	
18,000	72,000	.007917	.001417	.....	.....	
18,500	74,000	.009583	.001666	.....	.....	
19,000	76,000	.011200	.001617	.....	.....	
19,500	78,000	.012900	.001700	.....	.....	
20,000	80,000	.014233	.001333	.....	.....	
20,500	82,000	.016000	.001767	.....	.....	
21,000	84,000	.017750	.001750	.....	.....	
21,500	86,000	.019500	.001750	.....	.....	
22,000	88,000	.021667	.002167	.....	.....	
22,500	90,000	.023533	.001866	.....	.....	
23,000	92,000	.025833	.002300	.....	.....	
23,500	94,000	.028417	.002584	.....	.....	
24,000	96,000	.030833	.002416	.....	.....	
24,500	98,000	.033750	.002917	.....	.....	
25,000	100,000	.037333	.003583	.....	.....	
25,500	102,000	.041167	.003834	.....	.....	
26,000	104,000	.045250	.004083	.....	.....	
26,500	106,000	.051083	.005833	.....	.....	
27,000	108,000	.0600	.008917	.....	.....	
27,500	110,000	.0717	.0117	.....	.....	
27,820	111,280	.0983	.0266	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	111,280
Elastic limit per square inch of original section	do...	58,000
Elongation per inch after rupture	inch..	0.1083
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per centum of original section		34.6
Position of rupture		″.80 from neck
Character of broken surface	granular; dull spot near circumference	
Elongation of inch sections		″.21*, ″.12, ″.08, ″.06, ″.06, ″.06

No. 1127.

12" M
A
No. 5
ter, ".564.
nal area, .25 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000117	.000117	0.	.....	
10,000	.000300	.000183	0.	.....	
15,000	.000433	.000133	0.	.....	
20,000	.000600	.000167	0.	.....	
25,000	.000767	.000167	0.	.....	
30,000	.000917	.000150	0.	.....	
35,000	.001083	.000166	0.	.....	
40,000	.001250	.000167	0.	.....	
45,000	.001400	.000150	0.	.....	
50,000	.001583	.000183	.000017	.000017	
51,000	.001600	.000017	.....	.....	
52,000	.001633	.000033	.....	.....	
53,000	.001683	.000050	.....	.....	
54,000	.001733	.000050	.....	.....	
55,000	.001800	.000067	.000050	.000033	Elastic limit.
56,000	.002033	.000233	.....	.....	
57,000	.002367	.000334	.....	.....	
58,000	.002717	.000350	.....	.....	
59,000	.003083	.000366	.....	.....	
60,000	.003700	.000617	.001633	.001583	
62,000	.004850	.001150	.....	.....	
64,000	.006167	.001317	.....	.....	
66,000	.007667	.001500	.....	.....	
68,000	.009100	.001433	.....	.....	
70,000	.010700	.001800	.....	.....	
72,000	.012167	.001467	.....	.....	
74,000	.013750	.001583	.....	.....	
76,000	.015583	.001833	.....	.....	
78,000	.017500	.001917	.....	.....	
80,000	.019333	.001833	.....	.....	
82,000	.021033	.001700	.....	.....	
84,000	.022833	.001800	.....	.....	
86,000	.024917	.002084	.....	.....	
88,000	.027033	.002116	.....	.....	
90,000	.029550	.002517	.....	.....	
92,000	.032667	.003117	.....	.....	
94,000	.035833	.003166	.....	.....	
96,000	.039083	.003250	.....	.....	
98,000	.043667	.004584	.....	.....	
100,000	.049000	.005333	.....	.....	
102,000	.0550	.0060	.....	.....	
104,000	.0650	.0100	.....	.....	
106,000	.0817	.0167	.....	.....	
106,800	.1150	.0333	.....	.....	Tensile strength.

General summary.

ıgth per square inch of original section	pounds..	106,800
per square inch of original section	do...	55,000
er inch after rupture	inch..	0.1383
er inch under strain at elastic limit	do...	.001800
diameter at point of rupture	do...	.094
area after rupture, per centum of original section		30.6
ıpture		1 inch from neck
broken surface		granular; dull center
inch sections		".22*, ".16, ".12, ".11, ".12, ".10

No. 1128.

Marks, $\frac{12''\ M}{A\ \text{No. } 6}$

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarl
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000333	.000183	0.	.....	
3,750	15,000	.000467	.000134	0.	.....	
5,000	20,000	.000617	.000150	0.	.....	
6,250	25,000	.000767	.000150	0.	.....	
7,500	30,000	.000950	.000183	.000017	.000017	
8,750	35,000	.001117	.000167	.000017	0.	
10,000	40,000	.001283	.000166	.000017	0.	
11,250	45,000	.001450	.000167	.000017	0.	
12,500	50,000	.001617	.000167	.000033	.000016	
12,750	51,000	.001650	.000033	.....	.....	
13,000	52,000	.001683	.000033	.....	.....	
13,250	53,000	.001733	.000050	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	Elastic limit.
13,750	55,000	.001867	.000084	.000100	.000067	
14,000	56,000	.001983	.000116	.....	.....	
14,250	57,000	.002133	.000150	.....	.....	
14,500	58,000	.002267	.000134	.....	.....	
14,750	59,000	.002483	.000216	.....	.....	
15,000	60,000	.002983	.000500	.000950	.000850	
15,500	62,000	.003933	.000950	.....	.....	
16,000	64,000	.005283	.001350	.....	.....	
16,500	66,000	.006750	.001467	.....	.....	
17,000	68,000	.008250	.001500	.....	.....	
17,500	70,000	.009600	.001350	.....	.....	
18,000	72,000	.011167	.001567	.....	.....	
18,500	74,000	.012667	.001500	.....	.....	
19,000	76,000	.014333	.001666	.....	.....	
19,500	78,000	.016250	.001917	.....	.....	
20,000	80,000	.018000	.001750	.....	.....	
20,500	82,000	.019500	.001500	.....	.....	
21,000	84,000	.021333	.001833	.....	.....	
21,500	86,000	.023667	.002334	.....	.....	
22,000	88,000	.025667	.002000	.....	.....	
22,500	90,000	.028200	.002533	.....	.....	
23,000	92,000	.030833	.002633	.....	.....	
23,500	94,000	.033683	.002850	.....	.....	
24,000	96,000	.037167	.003484	.....	.....	
24,500	98,000	.040833	.003666	.....	.....	
25,000	100,000	.045667	.004834	.....	.....	
25,500	102,000	.051250	.005583	.....	.....	
26,000	104,000	.058750	.007500	.....	.....	
26,500	106,000	.0733	.014550	.....	.....	
26,900	107,600	.1017	.0284	.....	.....	Tensile strong

General summary.

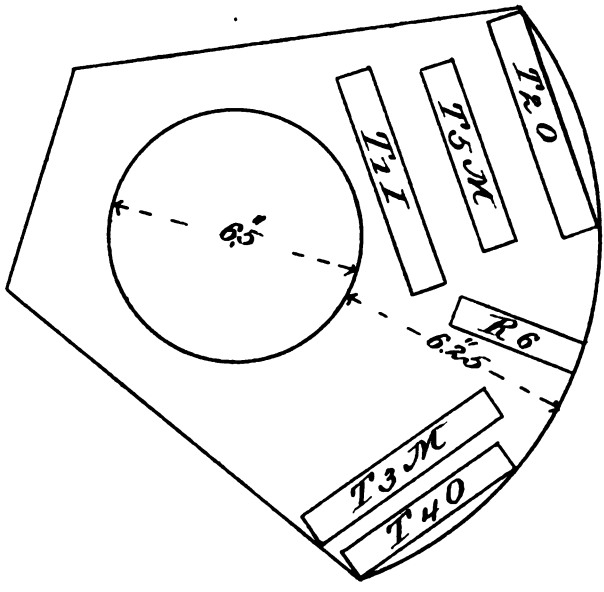
Tensile strength per square inch of original section ..... poun
Elastic limit per square inch of original section ..... d
Elongation per inch after rupture ..... in
Elongation per inch under strain at elastic limit ..... d
Reduction in diameter at point of rupture ..... d
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ".
Character of broken surface ..... granular
Elongation of inch sections ..... ".23*, ".12, ".10, "

FRICTIONAL RESISTANCE EXPERIMENTS.

TESTS OF SPECIMENS TAKEN FROM TUBE SECTION.

Frictional Resistance Exp.

Slice from end of tube cylinder.



H Ex 31 49 2

Axes of outside and middle specimens about 2 inches from end of forging; axis of inside specimen about three-fourths of an inch from end of forging.

No. 2209.

Marks, $\frac{8\,T\,Cex}{T,\,I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000233	.000166	0.	.....	
3,750	15,000	.000467	.000234	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001100	.000133	0.	.....	
10,000	40,000	.001300	.000200	0.	.....	
10,250	41,000	.001300	0.	.....	.....	
10,500	42,000	.001367	.000067	.....	.....	
10,750	43,000	.001433	.000066	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001467	0.	0.	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001600	.000100	.....	.....	
12,000	48,000	.001700	.000100	.....	.....	
12,250	49,000	.001767	.000067	.....	.....	Elastic limit.
12,500	50,000	.001967	.000200	.000300	.000300	
12,750	51,000	.002267	.000300	.....	.....	
13,000	52,000	.003567	.001300	.....	.....	
13,250	53,000	.004567	.001000	.....	.....	
13,500	54,000	.005833	.001266	.....	.....	
13,750	55,000	.006833	.001000	.....	.....	
14,000	56,000	.008133	.001300	.....	.....	
14,250	57,000	.009133	.001000	.....	.....	
14,500	58,000	.010133	.001000	.....	.....	
14,750	59,000	.011100	.000967	.....	.....	
15,000	60,000	.012333	.001233	.....	.....	
15,500	62,000	.014133	.001800	.....	.....	
16,000	64,000	.016600	.002467	.....	.....	
16,500	66,000	.018667	.002067	.....	.....	
17,000	68,000	.021167	.002500	.....	.....	
17,500	70,000	.024000	.002833	.....	.....	
18,000	72,000	.026700	.002700	.....	.....	
18,500	74,000	.030033	.003333	.....	.....	
19,000	76,000	.034000	.003967	.....	.....	
19,500	78,000	.038467	.004467	.....	.....	
20,000	80,000	.044000	.005533	.....	.....	
20,500	82,000	.050333	.006333	.....	.....	
21,000	84,000	.0600	.009667	.....	.....	
21,500	86,000	.0767	.0167	.....	.....	
22,000	88,000	.0967	.0200	.....	.....	
22,270	89,080	.1400	.0433	.....	.....	Tensile strength.

General summary.

Specific gravity		7.8556
Hardness		17.17
Tensile strength per square inch of original section	pounds	89,080
Elastic limit per square inch of original section	do	49,000
Elongation per inch after rupture	inch	0.2333
Elongation per inch under strain at elastic limit	do	.001767
Reduction in diameter at point of rupture	do	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		1".3 from neck
Character of broken surface	silky; traces of granulation	
Elongation of inch sections		".12, ".37*, ".21

No. 2210.

Marks, $^{8\,T\,Cex}_{T_2\,O}$
Diameter, ".565.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000367	.000200	0.	.....	
3,750	15,000	.000500	.000133	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001000	.000167	0.	.....	
8,750	35,000	.001176	.000167	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
10,250	41,000	.001376	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001400	0.	.....	.....	
11,000	44,000	.001467	.000067	.....	.....	
11,250	45,000	.001500	.000033	0.	.....	
11,500	46,000	.001533	.000033	.....	.....	
11,750	47,000	.001567	.000034	.....	.....	
12,000	48,000	.001600	.000033	.....	.....	Elastic limit.
12,250	49,000	.001700	.000100	.....	.....	
12,500	50,000	.002033	.000333	.000400	.000400	
12,750	51,000	.002500	.000467	.....	.....	
13,000	52,000	.003733	.001233	.....	.....	
13,250	53,000	.004833	.001100	.....	.....	
13,500	54,000	.006000	.001167	.....	.....	
13,750	55,000	.007067	.001067	.....	.....	
14,000	56,000	.008333	.001266	.....	.....	
14,250	57,000	.009333	.001000	.....	.....	
14,500	58,000	.010400	.001067	.....	.....	
14,750	59,000	.011400	.001000	.....	.....	
15,000	60,000	.012700	.001300	.....	.....	
15,500	62,000	.014833	.002133	.....	.....	
16,000	64,000	.017000	.002167	.....	.....	
16,500	66,000	.019667	.002667	.....	.....	
17,000	68,000	.022000	.002333	.....	.....	
17,500	70,000	.024833	.002833	.....	.....	
18,000	72,000	.028000	.003167	.....	.....	
18,500	74,000	.031333	.003333	.....	.....	
19,000	76,000	.035333	.004000	.....	.....	
19,500	78,000	.040000	.004667	.....	.....	
20,000	80,000	.046667	.006667	.....	.....	
20,500	82,000	.053333	.006666	.....	.....	
21,000	84,000	.064667	.011334	.....	.....	
21,500	86,000	.0867	.022033	.....	.....	
21,960	87,840	.1367	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,840
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.175
Reduction in area after rupture, per centum of original section		52.2
Position of rupture		at middle of stem
Character of broken surface		silky; traces of granulation
Elongation of inch sections		".16, ".44, ".15

No. 2211.

8, $\frac{8\ T\ Cex}{T_2\ M}$

eter, ″.565

onal area, .25 square inch.

lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000133	.000133	0.	.....	
10,000	.000267	.000134	0.	.....	
15,000	.000467	.000200	0.	.....	
20,000	.000667	.000200	0.	.....	
25,000	.000833	.000166	0.	.....	
30,000	.001000	.000167	0.	.....	
35,000	.001133	.000133	0.	.....	
40,000	.001300	.000167	0.	.....	
45,000	.001433	.000133	0.	.....	Elastic limit.
46,000	.001633	.000200	.....	.....	
47,000	.001867	.0 0234	.....	.....	
48,000	.003033	.001266	.....	.....	
49,000	.004067	.001034	.....	.....	
50,000	.005233	.001166	.003367	.003367	
51,000	.005833	.000600	.....	.....	
52,000	.007067	.001234	.....	.....	
53,000	.007833	.000766	.....	.....	
54,000	.009167	.001334	.....	.....	
55,000	.010000	.000833	.....	.....	
56,000	.011333	.001333	.....	.....	
57,000	.012500	.001167	.....	.....	
58,000	.013600	.001100	.....	.....	
59,000	.01 800	.001200	.....	.....	
60,000	.016133	.001333	.....	.....	
62,000	.018967	.002834	.....	.....	
64,000	.021000	.002033	.....	.....	
66,000	.023333	.002333	.....	.....	
68,000	.025800	.002467	.....	.....	
70,000	.029333	.003533	.....	.....	
72,000	.033000	.003667	.....	.....	
74,000	.037167	.004167	.....	.....	
76,000	.042000	.004833	.....	.....	
78,000	.049333	.007333	.....	.....	
80,000	.057333	.008000	.....	.....	
82,000	.0700	.012667	.....	.....	
84,000	.0933	.0233	.....	.....	
85,440	.1400	.0467	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	85,440
mit per square inch of original section	do...	45,000
n per inch after rupture	inch..	0.2333
n per inch under strain at elastic limit	do...	.001433
n in diameter at point of rupture	do...	.125
n in area after rupture, per centum of original section		39.2
f rupture	″.10 from middle of stem	
of broken surface	granular; dull spot at circumference	
n of inch sections	″.18, ″.36*, ″.16	

No. 625.

Marks, $\frac{8\,T\,Cex}{T_4\,O}$
Length, 5″.009.
Diameter, ″.799.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	0.	.....	
5,000	10,000	.000267	.000134	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001067	.000134	.000033	.000033	
19,000	38,000	.001200	.000133	.....	.....	
19,500	39,000	.001267	.000067	.....	.....	
20,000	40,000	.001300	.000033	.000033	0.	
20,500	41,000	.001333	.000033	.....	.....	
21,000	42,000	.001367	.000034	.....	.....	
21,500	43,000	.001400	.000033	.....	.....	
22,000	44,000	.001433	.000033	.....	.....	
22,500	45,000	.001467	.000034	.000067	.000034	
23,000	46,000	.001500	.000033	.....	.....	Elastic limit.
23,500	47,000	.001600	.000100	.....	.....	
24,000	48,000	.002500	.000900	.....	.....	
24,500	49,000	.008433	.005933	.....	.....	
25,000	50,000	.009000	.000567	.006967	.006900	
38,850	77,700	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section ..... pounds.. 46.000
Compression per inch under stress at elastic limit ..... inch.. 0.001500
Ultimate strength per square inch of original section ..... pounds.. 77.700
Manner of failure ..... triple flexure

No. 626.

Marks, $\frac{8\ T\ Cex}{T_8\ M}$
Length, 5″.011.
Diameter, ″.798.
Sectional area, .50 square inch.

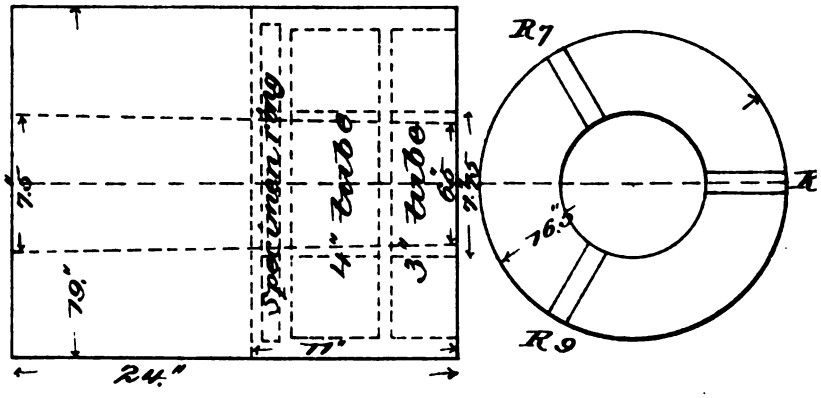
Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	0.	.....	
5,000	10,000	.000267	.000134	0.	.....	
7,500	15,000	.000400	.000133	0.	.....	
10,000	20,000	.000600	.000200	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000967	.000200	.000067	.000067	
17,500	35,000	.001167	.000200	.000133	.000066	
20,000	40,000	.001333	.000166	.000233	.000100	
20,500	41,000	.001400	.000067	.....	.....	
21,000	42,000	.001467	.000067	.....	.....	
21,500	43,000	.001500	.000033	.....	.....	
22,000	44,000	.001600	.000100	.....	.....	
22,500	45,000	.001600	0.	.000333	.000100	
23,000	46,000	.001700	.000100	.....	.....	
23,500	47,000	.001767	.000067	.....	.....	Elastic limit.
24,000	48,000	.001867	.000100	.....	.....	
24,500	49,000	.002067	.000200	.....	.....	
25,000	50,000	.002500	.000433	.000933	.000600	
25,500	51,000	.003500	.001000	.....	.....	
26,000	52,000	.004767	.001267	.....	.....	
41,300	82,600	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds	47,000
Compression per inch under stress at elastic limit	inch	0.001767
Ultimate strength per square inch of original section	pounds	82,600
Manner of failure		triple flexure

Frictional Resistance Experiments

Tube cylinder



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No. 679.

Marks, Ex $\frac{8\,R}{T\,(F\,R)}$ $\frac{}{R_7}$
Length, 4″.005.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000233	.000133	0.	.....	
7,500	15,000	.000433	.000200	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001100	.000167	0.	.....	
20,000	40,000	.001333	.000233	.000033	.000033	Elastic limit.
20,500	41,000	.001833	.000500	.....	.....	
21,000	42,000	.001967	.000134	.....	.....	
21,500	43,000	.002400	.000433	.....	.....	
22,000	44,000	.003067	.000667	.....	.....	
22,500	45,000	.003667	.000600	.....	.....	
23,000	46,000	.004667	.001000	.....	.....	
23,500	47,000	.005333	.000666	.....	.....	
24,000	48,000	.006467	.001134	.....	.....	
24,500	49,000	.007267	.000800	.....	.....	
25,000	50,000	.008167	.000900	.....	.....	
25,500	51,000	.009067	.000900	.....	.....	
26,000	52,000	.009867	.000800	.....	.....	
26,500	53,000	.010867	.001000	.....	.....	
27,000	54,000	.011500	.000633	.....	.....	
27,500	55,000	.012333	.000833	.....	.....	
45,700	91,400	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	40,000
Compression per inch under stress at elastic limit	inch..	0.001333
Ultimate strength per square inch of original section	pounds..	91,400
Manner of failure		triple flexure

No. 680.

Marks, Ex $\overset{8\,R}{T}$ (F $\underset{R_8}{R}$)
Length, 4″.004.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	0.	.....	
5,000	10,000	.000300	.000167	0.	.....	
7,500	15,000	.000467	.000167	0.	.....	
10,000	20,000	.000633	.000166	0.	.....	
12,500	25,000	.000800	.000167	0.	.....	
15,000	30,000	.000967	.000167	0.	.....	
17,500	35,000	.001133	.000166	0.	.....	
18,000	36,000	.001167	.000034	.....	.....	
18,500	37,000	.001200	.000033	.....	.....	
19,000	38,000	.001267	.000067	.....	.....	
19,500	39,000	.001333	.000066	.....	.....	
20,000	40,000	.001367	.000034	.....	.....	Elastic limit.
20,500	41,000	.001600	.000233	.....	.....	
21,000	42,000	.001733	.000133	.....	.....	
21,500	43,000	.002633	.000900	.....	.....	
22,000	44,000	.003333	.000700	.....	.....	
22,500	45,000	.004167	.000834	.....	.....	
23,000	46,000	.004967	.000800	.....	.....	
23,500	47,000	.005967	.001000	.....	.....	
24,000	48,000	.006933	.000966	.....	.....	
24,500	49,000	.007833	.000900	.....	.....	
25,000	50,000	.008667	.000834	.....	.....	
25,500	51,000	.009533	.000866	.....	.....	
26,000	52,000	.010333	.000800	.....	.....	
26,500	53,000	.011233	.000900	.....	.....	
27,000	54,000	.012000	.000767	.....	.....	
27,500	55,000	.012900	.000900	.....	.....	
45,500	91,000	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section .....pounds
Compression per inch under stress at elastic limit .....inch
Ultimate strength per square inch of original section .....pounds
Manner of failure .....triple

No. 681.

Marks, Ex T (F R) (S R / Rs)
Length, 4″.005.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35.000	.001100	.000167	.000033	.000033	
18,000	36,000	.001133	.000033	.....	.....	
18,500	37,000	.001200	.000067	.....	.....	
19,000	38,000	.001233	.000033	.....	.....	Elastic limit.
19,500	39,000	.001333	.000100	.....	.....	
20,000	40,000	.001567	.000234	.....	.....	
20,500	41,000	.002100	.000533	.....	.....	
21,000	42,000	.002533	.000433	.....	.....	
21,500	43,000	.003233	.000700	.....	.....	
22,000	44,000	.004000	.000767	.....	.....	
22,500	45,000	.004833	.000833	.....	.....	
23,000	46,000	.005667	.000834	.....	.....	
23,500	47,000	.006667	.001000	.....	.....	
24,000	48,000	.007667	.001000	.....	.....	
24,500	49,000	.008667	.001000	.....	.....	
25,000	50,000	.009367	.000700	.....	.....	
25,500	51,000	.010200	.000833	.....	.....	
26,000	52,000	.011167	.000967	.....	.....	
26,500	53,000	.012000	.000833	.....	.....	
27,000	54,000	.012833	.000833	.....	.....	
27,500	55,000	.013767	.000934	.....	.....	
44,700	89,400	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	38,000
Compression per inch under stress at elastic limit	inch..	0.001233
Ultimate strength per square inch of original section	pounds..	89,400
Manner of failure		triple flexure

FRICTIONAL RESISTANCE

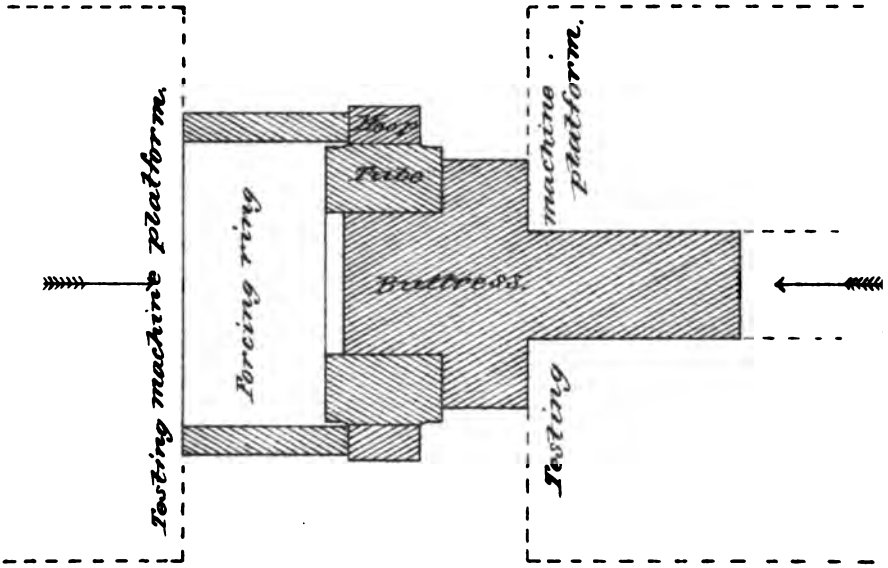
OF

STEEL HOOPS

SHRUNK ON STEEL TUBES.

Frictional resistance experiments

Showing attachments in position for unhooping.



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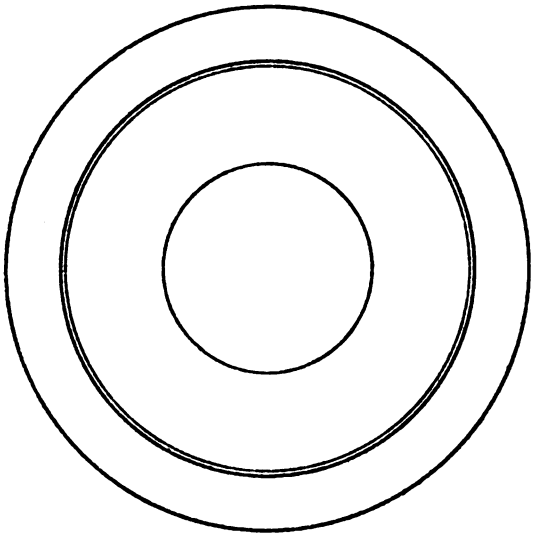
Frictional resistance experiment

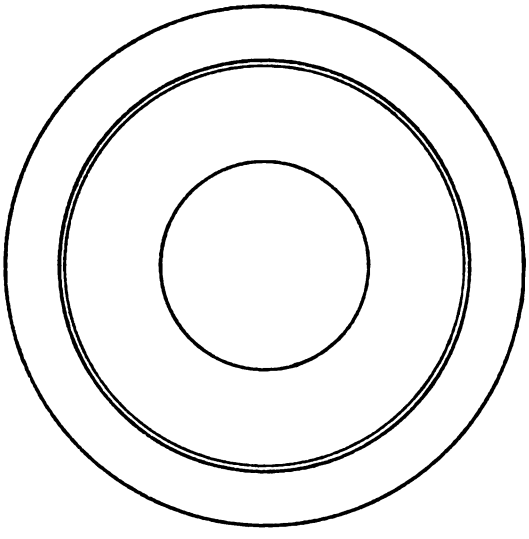
4" hoop and tube

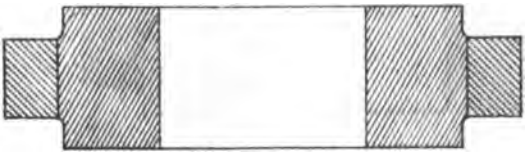


H Ex 31 492

Frictional resistance experiments

3" hoop and tube





H Ex 31 49 2

TIONAL RESISTANCE OF STEEL HOOPS SHRUNK ON STEEL TUBES.

: hoops and tubes were received at the Watertown Arsenal in assembled state, having been prepared and shrunk together at Point foundry under the supervision of Lieut. R. Birnie, jr., Ord- : Department, U. S. A.

: estimated temperature of the 3-inch hoop when taken from the ce to assemble was 470° Fahr.; that of the 4-inch hoop 515° Fahr. Watertown Arsenal the accessible diameters were measured be- ınhooping and again after unhooping, the several diameters mak- ıual angles with each other. The unhooping was done by forcing oops from the tubes in the direction of their axes.

e end of a tube rested against a buttress in front of the flat plat- of the testing-machine, a cast-iron ring being used between the site platform and the hoop.

the details of the tests are shown the apparent movement of the ı on the tubes during the progress of the loading up to the max- ı resistance, and afterwards the diminishing loads on the hoops at vals until they were wholly removed from the tubes.

tervals of rest of longer or shorter duration were allowed, and the : on the frictional resistance observed.

e hoops did not slip over the tubes with a smooth continuous move- , but with a series of sudden slips and throbs, during which there fluctuations of the loads.

ater was sprinkled upon the assembled parts while they were hot, h is thought to account for its presence on the frictional surfaces unhooping.

ıce in shrinkage diameters before and after unhooping:		
ch hoop and tube	inch..	0.016434
ch hoop and tube	do...	0.016350
ım frictional resistance found:		
ch hoop and tube	pounds..	265,800
ch hoop and tube	do....	404,100

EXTERIOR DIAMETERS OF 3″ HOOP.

BEFORE UNHOOPING

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.5	20.0165	20.0164	20.0156	20.0158	20.016075
1.5	20.0164	20.0162	20.0153	20.0152	20.015775
2.5	20.0159	20.0158	20.0146	20.0147	20.015250

.....20″.0157

AFTER UNHOOPING.

0.5	20.0042	20.0043	20.0041	20.0042	20.004200
1.5	20.0041	20.0038	20.0038	20.0036	20.003875
2.5	20.0036	20.0034	20.0033	20.0033	20.003400

.....20″.003825. Restoration.....0″.011875

INTERIOR DIAMETERS OF 3″ HOOP.

AFTER UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.5	15.7463	15.7462	15.7463	15.7463	15.746275
1.5	15.7451	15.7450	15.7452	15.7452	15.745125
2.5	15.7459	15.7460	15.7459	15.7461	15.745975

Mean ..... 15″.745791

DIAMETERS OF BORE OF TUBE WITH 3″ HOOP.

BEFORE UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.50	7.9946	7.9953	7.9952	7.9954	7.995125
2.75	7.9960	7.9961	7.9957	7.9957	7.995875
5.00	7.9968	7.9969	7.9970	7.9968	7.996875

Mean ..... 7″.995958

AFTER UNHOOPING.

0.50	7.9970	7.9971	7.9971	7.9975	7.997175
2.75	7.9980	7.9984	7.9980	7.9985	7.998225
5.00	7.9988	7.9988	7.9988	7.9988	7.998800

Mean ..... 7″.998066 Restoration ..... 0″.002108

EXTERIOR DIAMETERS OF TUBE WITH 3″ HOOP.

AFTER UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.5	15.7625	15.7626	15.7627	15.7625	15.762575
1.5	15.7620	15.7620	15.7621	15.7620	15.762025
2.5	15.7621	15.7620	15.7621	15.7621	15.762075

Mean ..... 15″.762225

EXTERIOR DIAMETERS OF 4″ HOOP.

BEFORE UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.5	20.0246	20.0246	20.0246	20.0246	20.024600
2.0	20.0238	20.0238	20.0238	20.0237	20.023775
3.5	20.0226	20.0226	20.0226	20.0222	20.022500

.....20″.023625

AFTER UNHOOPING.

0.5	20.0137	20.0138	20.0142	20.0142	20.013975
2.0	20.0124	20.0123	20.0128	20.0128	20.012575
3.5	20.0109	20.0112	20.0112	20.0110	20.011075

.....20″.012541 Restoration .....0″.011084

INTERIOR DIAMETERS OF 4″ HOOP.

AFTER UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.5	15.7456	15.7459	15.7462	15.7460	15.745925
2.0	15.7458	15.7462	15.7468	15.7462	15.746250
3.5	15.7459	15.7461	15.7462	15.7462	15.746100

.....15″.746092

DIAMETERS OF BORE OF TUBE WITH 4″ HOOP.

BEFORE UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.50	7.9919	7.9919	7.9919	7.9918	7.991875
3.25	7.9903	7.9903	7.9902	7.9903	7.990275
6.00	7.9923	7.9921	7.9922	7.9921	7.992175

..... 7″.991441

AFTER UNHOOPING.

0.50	7.9945	7.9945	7.9941	7.9944	7.994375
3.25	7.9931	7.9933	7.9930	7.9930	7.993100
6.00	7.9947	7.9947	7.9946	7.9944	7.994600

..... 7″.994025 Restoration..... 0″.002581

EXTERIOR DIAMETERS OF TUBE WITH 4″ HOOP.

AFTER UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.5	15.7617	15.7620	15.7620	15.7620	15.761925
2.0	15.7623	15.7624	15.7625	15.7624	15.762400
3.5	15.7628	15.7633	15.7631	15.7628	15.763000

Mean ..... 15″.762442

FRICTIONAL RESISTANCE BETWEEN TUBE AND 3″ HOOP.

DETAILS.

Applied loads.	Total movement.	Time.	Remarks.
Pounds.	*Inches.*	*Seconds.*	
50,000	0.	.....	Initial load.
89,000	0.	.....	
100,000	.0006	.....	Micrometer measurements were taken between the hoop and face of platform of testing machine. Hence the apparent movement of the hoop on the tube includes the compression of the cast-iron platform.
150,000	.0014	.....	
200,000	.0024	.....	
220,000	.0025	.....	
240,000	.0035	.....	
245,000	.0038	.....	
250,000	.0030	.....	
200,000	.0030	.....	
265,800	.....	.....	Maximum frictional resistance. Sudden slip of hoop on tube.
.....	.0504	.....	After the slip.
132,000	.....	.....	Continues the movement.
130,400	.1138	.....	

[Micrometer measurements now taken from platform to platform.]

128,000	.1138	.....	Rested 10 minutes.
137,000	.1140	.....	
140,000	.1140	.....	
143,900	.....	.....	Maximum resistance after the rest. Sudden slip load and reading now.
116,000	.1220	.....	
127,000	.1257	.....	
125,000	.1260	.....	Rested about 3 minutes.
136,500	.1275	.....	
140,000	.....	.....	Sudden slip.
122,000	.1338	.....	After slip.
128,000	.2650	.....	Movement continues.

The hoop kept in motion, the resistance varying from 128,000 to 138,000 pounds, with unsteady movement as before. A final sudden slip of the hoop reduced the load to 113,000 pounds, the total movement being ″.4970, when the test was discontinued.

Contact surfaces in sight were slightly rusty, which it is thought took place after the surfaces were exposed to the air.

After a rest under zero load of 25 hours 45 minutes the loading was renewed.

IONAL RESISTANCE BETWEEN TUBE AND 3″ HOOP—Continued.

DETAILS—Continued.

d	Total movement.	Time.	Remarks.	
.	*Inches.*	*Seconds.*		
0	.4970	.....		
0	.....	.....	Maximum resistance after above rest.	
0	.5074	.....	After sudden slip.	
0	.52	.....		
0	.53	38		
0	.54	34		
0	.55	19		
0	.56	19		
0	.575	28		
0	.588 / .59	24		
0	.60	22		
0	.612	22		
0	.625 / .6375	19 / 23		
0	.64	.....		
0	.65	24		
0	.662	18		
0	.675	20		
0	.684	15		
0	.698	19		
0	.7045	10		
0	.7165	18		
0	.725	13		
0	.7375	15		
0	.746	12		
0	.7545	12		
0	.764	13		
0	.775	11		
0	.786	18		
0	.794	11		
0	.804	14		
0	.814	11		
0	.8225	13		
0	.832	13		
0	.842	11		
0	.856	18		
0	.866	13		
0	.875	13		
0	.886	14		
0	.896	13		
0	.905	13		
0	.916	14		
0	.931	19		
0	.941	15		
0	.951	13		
0	.961	13		
0	.972	14		
0	.983	15		
0	.994	13		
0	1.00	19		
0	1.00	.....	Rested 15 minutes.	
0	.....	.....	Maximum resistance after above rest.	
0	1.10	.....	Number of throbs between readings.	
0	1.20	48		
0	1.30	52		
0	1.40	51		
0	1.50	52		
0	1.60	54		
0	1.70	47	11	
0	1.80	48	12	
0	1.90	50	13	
0	2.00	47	14	
0	2.10	48	14	
0	2.20	44	16	
0	2.30	44	16	
0	2.40	42	17	
0	2.50	42	22	
0	2.60	41		
0	2.70	34		
0	2.80	73		
0	2.90	73		

onal surface of the tube well polished, but retains marks of ing tool.

sponding surface of the hoop shows no material change in its nce resulting from the test.

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4″ HOOP.

DETAILS.

Applied loads.	Total movement.	Time.	Remarks.
Pounds.	*Inches.*	*Seconds.*	
50,000	0.	.....	Initial load.
100,000	.0024	.....	Micrometer readings taken from platform to platform of testing-machine.
150,000	.0048	.....	
200,000	.0068	.....	
220,000	.0079	.....	
240,000	.0089	.....	
260,000	.0096	.....	
280,000	.0102	.....	
300,000	.0109	.....	
320,000	.0118	.....	
340,000	.0127	.....	
350,000	.0132	.....	
360,000	.0138	.....	
370,000	.0143	.....	
380,000	.0146	.....	
390,000	.0149	.....	
400,000	.0154	.....	
404,100	.....	.....	Maximum frictional resistance. Sudden slip.
129,700	.0848	.....	Load and reading after slip.
211,000	.0930	.....	Continues the motion.
173,500	.2581	.....	Rested 10 minutes.
187,800	.....	.....	Maximum resistance after above rest. Motion caused without sudden slip
193,800	.39	.....	
202,000	.40	.....	
191,700	.41	65	
192,000	.42	27	
191,800	.43	32	
196,200	.44	31	
192,900	.45	24	
193,800	.46	23	
195,500	.47	25	
182,000	.48	7	
189,000	.49	.....	
186,000	.50	.....	
187,200	.51	9	
188,200	.52	9	
185,500	.53	9	
188,100	.54	9	
188,000	.55	9	
187,800	.56	8	
189,100	.57	10	
187,800	.58	9	
190,400	.59	10	
189,200	.60	.....	
189,700	.61	9	
190,300	.62	8	
188,800	.63	9	
190,600	.64	10	
190,200	.65	10	
190,900	.66	10	
191,200	.67	8	
190,400	.68	9	
191,400	.69	10	
190,600	.70	9	
191,600	.71	9	
189,800	.72	9	
184,000	.73	8	Sudden slip
188,000	.74	10	
184,000	.75	8	Do.
190,400	.76	9	Do.
183,000	.77	8	Do.
188,000	.78	10	Do.
189,000	.79	11	Do.
180,000	.80	8	Do.
187,000	.81	11	Do.
189,000	.82	8	Do.
188,000	.83	9	
188,500	.84	11	
188,000	.85	6	
188,900	.86	13	
188,000	.87	6	
189,000	.88	12	
180,000	.89	9	Do.
178,000	.90	5	Do.
179,000	.91	15	Do.
.....	.92	6	
183,000	.93	11	

TIONAL RESISTANCE BETWEEN TUBE AND 4" HOOP—Continued.

DETAILS—Continued.

lied ls.	Total movement.	Time.	Remarks.
ds.	*Inches.*	*Seconds.*	
.....	.94	11	Sudden slip.
000	.95	5	
800	.96	14	
900	.98	19	
900	1.00	.....	Test discontinued. Time, 12.11 p. m.

tion surfaces slightly rusty, occurring after exposure to the air. drops of water observed at the joint of the hoop and tube after scontinuance of the test.

resumed after a rest of 26 hours 35 minutes under zero load.

lied ls.	Total movement.	Time.	Remarks.
ds.	*Inches.*	*Seconds.*	
000	1.00	.....	
900	1.0060	.....	
000	1.0085	.....	
800	.....	.....	Sudden slip.
000	1.0234	.....	Load and reading after slip.
000	.....	.....	Maximum resistance after resting. Sudden slip.
000	1.0817	.....	
000	.....	.....	Continues the movement.
000	1.10	.....	
000	1.1375	.....	
000	1.145	49	
000	1.17	34	
000	1.1865	34	
000	1.19	25	
000	1.205	13	
000	1.218	26	
000	1.220	18	
000	1.238	19	
000	1.24	18	
000	1.255	14	
000	1.267	24	
000	1.27	13	
000	1.2816	11	
800	1.293	21	
000	1.307	20	
000	1.31	12	
800	1.319	7	
000	1.332	18	
000	1.344	19	
800	1.357	18	
000	1.36	11	
000	1.369	7	
800	1.382	20	
800	1.393	17	
000	1.407	19	
000	1.41	11	
000	1.425	13	
000	1.433	18	
000	1.444	12	
000	1.4605	24	
000	1.47	18	
500	1.461	11	
000	1.477	23	
000	1.493	23	
000	1.503	15	
500	1.5135	14	
000	1.525	13	
500	1.5375	20	
000	1.54	9	
000	1.549	7	
000	1.561	14	
000	1.572	16	
500	1.585	16	
500	1.5955	15	
000	1.6080	16	
000	1.619	17	
800	1.6315	13	

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4″ HOOP—Continued.

DETAILS—Continued.

Applied loads.	Total movement.	Time.	Remarks.	
Pounds.	*Inches.*	*Seconds.*		
161,500	1.649	22		
160,500	1.6645	20		
148,000	1.672	10		
159,500	1.689	21		
158,500	1.7045	19		
140,000	1.7115	11		
143,000	1.7190	7		
141,000	1.728	10		
148,000	1.736	9		
153,000	1.747	23		
144,000	1.753	18		
151,000	1.762	22		
149,500	1.77	23		
159,500	1.785	34		
139,000	1.79	17		
149,000	1.799	23		
148,000	1.808	20		
143,000	1.8145	18		
148,000	1.823	23		
148,000	1.832	21		
154,000	1.846	33		
139,000	1.8515	17		
145,000	1.86	20		
144,000	1.868	20		
142,000	1.875	19		
143,000	1.883	20		
152,000	1.8975	30		
134,000	1.9020	17		
143,500	1.91	20		
153,000	1.925	29		
123,000	1.998	.....		
116,000	.....	.....	Rested 15 minutes.	
139,500	.....	.....	Sudden slip.	
145,000	.....	.....	Maximum resistance after 15 minutes' rest.	
128,000	2.12	.....		
123,000	2.22	54		
			Number of throbs between readings.	
114,000	2.30	46	12	
110,000	2.42	39	14	
105,000	2.50	44	15	
99,400	2.62	50	15	
93,800	2.72	49	16	
88,000	2.82	45	17	
83,500	2.92	45	18	
78,500	3.02	44	18	
74,300	3.12	48	19	
69,200	3.22	46	18	
64,600	3.42	87	34	
59,900	3.52	46	14	
54,500	3.62	44	13	
51,500	3.72	43	15	
51,800	3.82	42	11	
46,000	3.92	58	12	

After a movement of the hoop of 1″.10 there was a succession of sudden slips, continuing through the remainder of the test.

Frictional surface of the tube well polished in a higher degree than the surface of the tube with the 3″ hoop. The remaining tool-marks also were deeper.

No material change produced on the corresponding surface of the hoop.

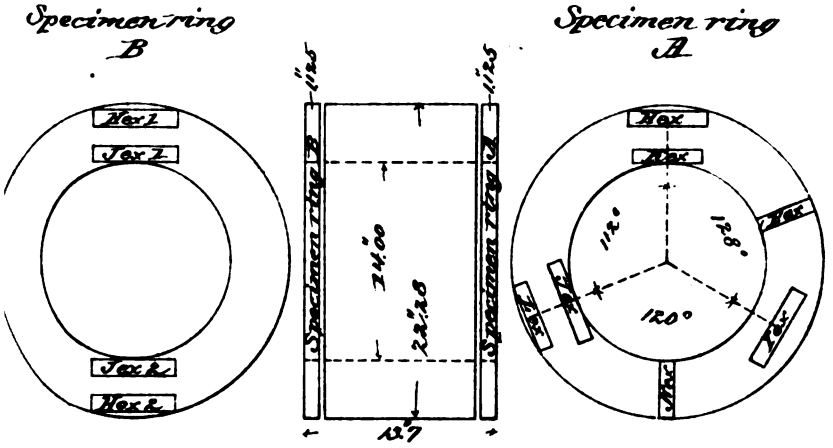
REMNANT OF WHITWORTH STEEL JACKET CYLINDER.

Specimens taken from a section of the jacket which was shrunk up on a wrought-iron tube, and removed from shrinkage by the application of high furnace heat.

[See report of Chief of Ordnance, U. S. Army, 1885, Appendix 31, for details of shrinkage.]

Remnant of Jacket cylinder.

Experimental section.



H Ex 31 49 2

No. 1171.

s, H E X.
eter, ".564.
onal area, .25 square inch.

lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000067	.000067	0.	.....	
10,000	.000233	.000166	0.	.....	
15,000	.000400	.000167	0.	.....	
20,000	.000567	.000167	0.	.....	
25,000	.000733	.000166	0.	.....	
30,000	.000900	.000167	0.	.....	
35,000	.001067	.000167	0.	.....	
40,000	.001233	.000166	0.	.....	
45,000	.001400	.000167	0.	.....	
46,000	.001400	.0	.....	.....	
47,000	.001433	.000033	.....	.....	
48,000	.001467	.000034	.....	.....	
49,000	.001500	.000033	.....	.....	
50,000	.001567	.000067	0.	.....	
51,000	.001600	.000033	.....	.....	
52,000	.001633	.000033	.....	.....	
53,000	.001667	.000034	.....	.....	
54,000	.001700	.000033	.....	.....	
55,000	.001733	.000033	.000033	.000033	Elastic limit.
56,000	.002433	.000700	.....	.....	
57,000	.004833	.002400	.....	.....	
58,000	.006067	.001234	.....	.....	
59,000	.006567	.000500	.....	.....	
60,000	.007100	.000533	.004900	.004867	
62,000	.008133	.001033	.....	.....	
64,000	.009733	.001600	.....	.....	
66,000	.011233	.001500	.....	.....	
68,000	.012667	.001434	.....	.....	
70,000	.014367	.001700	.....	.....	
72,000	.015967	.001600	.....	.....	
74,000	.017700	.001733	.....	.....	
76,000	.019433	.001733	.....	.....	
78,000	.021433	.002000	.....	.....	
80,000	.023600	.002167	.....	.....	
82,000	.025733	.002133	.....	.....	
84,000	.028667	.002934	.....	.....	
86,000	.030900	.002233	.....	.....	
88,000	.034000	.003100	.....	.....	
90,000	.037433	.003433	.....	.....	
92,000	.040767	.003334	.....	.....	
94,000	.045167	.004400	.....	.....	
96,000	.051333	.006166	.....	.....	
98,000	.058000	.006667	.....	.....	
100,000	.066667	.008667	.....	.....	
102,000	.0867	.020033	.....	.....	
103,960	.1200	.0333	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	103,960
per square inch of original section	do...	55,000
per inch after rupture	inch..	0.1967
per inch under strain at elastic limit	do...	.001733
diameter at point of rupture	do...	.134
area after rupture, per centum of original section		41.9
ipture		1".00 from neck
broken surface		silky
inch sections		".30*, ".19, ".10

No. 1172.

Marks, I E X.
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000267	.000134	0.	.....	
3,750	15,000	.000400	.000133	0.	.....	
5,000	20,000	.000567	.000167	0.	.....	
6,250	25,000	.000733	.000166	0.	.....	
7,500	30,000	.000900	.000167	0.	.....	
8,750	35,000	.001033	.000133	0.	.....	
10,000	40,000	.001167	.000134	0.	.....	
11,250	45,000	.001367	.000200	.000033	.000033	
11,500	46,000	.001400	.000033	.....	.....	
11,750	47,000	.001433	.000033	.....	.....	
12,000	48,000	.001500	.000067	.....	.....	Elastic limit.
12,250	49,000	.001767	.000267	.....	.....	
12,500	50,000	.005167	.003400	.003767	.003734	
12,750	51,000	.008333	.003166	.....	.....	
13,000	52,000	.009367	.001034	.....	.....	
13,250	53,000	.009700	.000333	.....	.....	
13,500	54,000	.010400	.000700	.....	.....	
13,750	55,000	.011433	.001033	.009367	.005600	
14,000	56,000	.012400	.000967	.....	.....	
14,250	57,000	.012833	.000433	.....	.....	
14,500	58,000	.013767	.000934	.....	.....	
14,750	59,000	.015267	.001500	.....	.....	
15,000	60,000	.016167	.000900	.013767	.004400	
15,500	62,000	.017767	.001600	.....	.....	
16,000	64,000	.020700	.002933	.....	.....	
16,500	66,000	.023000	.002300	.....	.....	
17,000	68,000	.025667	.002667	.....	.....	
17,500	70,000	.028667	.003000	.....	.....	
18,000	72,000	.031333	.002666	.....	.....	
18,500	74,000	.034333	.003000	.....	.....	
19,000	76,000	.038333	.004000	.....	.....	
19,500	78,000	.042700	.004367	.....	.....	
20,000	80,000	.047667	.004967	.....	.....	
20,500	82,000	.055000	.007333	.....	.....	
21,000	84,000	.063167	.008167	.....	.....	
21,500	86,000	.076000	.012833	.....	.....	
22,000	88,000	.0967	.0207	.....	.....	
22,500	90,000	.1333	.0366	.....	.....	
22,510	90,040	.1533	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	90,[illegible]40
Elastic limit per square inch of original section	do	48,[illegible]00
Elongation per inch after rupture	inch	0.240[illegible]
Elongation per inch under strain at elastic limit	do	.0015[illegible]
Reduction in diameter at point of rupture	do	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		″.1 from middle of ste[illegible]n
Character of broken surface		silk[illegible]y
Elongation of inch sections		″.14, ″.40*, ″.[illegible]8

No. 1173.

:s, J E X.
ıeter, ″.564.
onal area, .25 square inch.

›lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1, 000	0.	0.	0.	0.	Initial load.
5, 000	. 000200	. 000200	. 000033	. 000033	
10, 000	. 000367	. 000167	. 000033	0.	
15, 000	. 000500	. 000133	. 000033	0.	
20, 000	. 000700	. 000200	. 000033	0.	
25, 000	. 000867	. 000167	. 000033	0.	
30, 000	. 001033	. 000166	. 000033	0.	
35, 000	. 001200	. 000167	. 000033	0.	
40, 000	. 001367	. 000167	. 000067	. 000034	
45, 000	. 001500	. 000133	. 000067	0.	
46, 000	. 001500	0.	.....	.....	
47, 000	. 001533	. 000033	.....	.....	
48, 000	. 001600	. 000067	.....	.....	
49. 000	. 001633	. 000033	.....	.....	
50, 000	. 001667	. 000034	. 000100	. 000033	
51, 000	. 001700	. 000033	.....	.....	
52, 000	. 001733	. 000033	.....	.....	
53, 000	. 001767	. 000034	.....	.....	
54, 000	. 001800	. 000033	.....	.....	
55, 000	. 001833	. 000033	. 000100	0.	
56, 000	. 001867	. 000034	.....	.....	
57, 000	. 001933	. 000066	.....	.....	Elastic limit.
58, 000	{ . 002000 { . 002200	. 000067 . 000200	.....	.....	
59, 000	. 002533	. 000333	.....	.....	
60, 000	. 006233	. 003700	. 004100	. 004000	
62, 000	. 007333	. 001100	.....	.....	
64, 000	. 008733	. 001400	.....	.....	
66, 000	. 010067	. 001334	.....	.....	
68, 000	. 012333	. 002266	.....	.....	
70, 000	. 013733	. 001400	.....	.....	
72, 000	. 015267	. 001534	.....	.....	
74, 000	. 017067	. 001800	.....	.....	
76, 000	. 018733	. 001666	.....	.....	
78, 000	. 020433	. 001700	.....	.....	
80, 000	. 022500	. 002067	.....	.....	
82, 000	. 024767	. 002267	.....	.....	
84, 000	. 027100	. 002333	.....	.....	
86, 000	. 029700	. 002600	.....	.....	
88, 000	. 032467	. 002767	.....	.....	
90, 000	. 036100	. 003633	.....	.....	
92, 000	. 039667	. 003567	.....	.....	
94, 000	. 045500	. 005833	.....	.....	
96, 000	. 050667	. 005167	.....	.....	
98, 000	. 056000	. 005333	.....	.....	
100, 000	. 064000	. 008000	.....	.....	
102, 000	. 080000	. 016000	.....	.....	
104, 000	. 1000	. 0200	.....	.....	
104, 200	. 1267	. 0267	.....	.....	Tensile strength.

General summary.

rength per square inch of original section	pounds..	104,200
ıit per square inch of original section	do...	57,000
ı per inch after rupture	inch..	0.1733
ı per inch under strain at elastic limit	do...	.001933
in diameter at point of rupture	do...	.074
in area after rupture, per centum of original section		24.6
f rupture	½ inch from middle of stem	
of broken surface	granular, radiating from a dull spot at the circumference	
ı of inch sections		″.16, ″.20*, ″.16

No. 572.

Marks, K E X.
Length, 5″.00.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000400	.000100	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000700	.000150	0.	.....	
15,000	30,000	.000850	.000150	0.	.....	
17,500	35,000	.001000	.000150	0.	.....	
20,000	40,000	.001150	.000150	0.	.....	
22,500	45,000	.001300	.000150	0.	.....	
25,000	50,000	.001500	.000200	.000050	.000050	
25,500	51,000	.001500	0.	.....	.....	
26,000	52,000	.001550	.000050	.....	.....	
26,500	53,000	.001550	0.	.....	.....	
27,000	54,000	.001600	.000050	.....	.....	
27,500	55,000	.001650	.000050	.000050	0.	
28,000	56,000	.001700	.000050	.....	.....	
28,500	57,000	.001700	0.	.....	.....	
29,000	58,000	.001750	.000050	.....	.....	
29,500	59,000	.001750	0.	.....	.....	
30,000	60,000	.001800	.000050	.000050	0.	
30,500	61,000	.001850	.000050	.....	.....	Elastic limit.
31,000	62,000	.001750	.000100	.....	.....	
31,500	63,000	.001900	.000150	.....	.....	
32,000	64,000	.002000	.000100	.....	.....	
32,500	65,000	.003000	.001000	.001000	.000950	
51,050	102,100	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section ..... pounds.. 61,000
Compression per inch under stress at elastic limit ..... inch.. 0.001850
Ultimate strength per square inch of original section ..... pounds.. 102,100
Manner of failure ..... triple flexure

No. 573.

s, L E X.
th, 5″.00.
eter, ″.798.
onal area, .50 square inch.

lied loads. Per square inch.	Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000150	.000150	0.	.....	
10,000	.000300	.000150	0.	.....	
15,000	.000450	.000150	0.	.....	
20,000	.000600	.000150	0.	.....	
25,000	.000750	.000150	0.	.....	
30,000	.000900	.000150	0.	.....	
35,000	.001050	.000150	0.	.....	
40,000	.001200	.000150	0.	.....	
45,000	.001350	.000150	0.	.....	
50,000	.001500	.000150	0.	.....	
51,000	.001500	0.	.....	.....	
52,000	.001550	.000050	.....	.....	
53,000	.001600	.000050	.....	.....	
54,000	.001650	.000050	.....	.....	
55,000	.001700	.000050	.000050	.000050	
56,000	.001800	.000100	.....	.....	
57,000	.001850	.000050	.....	.....	Elastic limit.
58,000	.002000	.000150	.....	.....	
59,000	.002050	.000050	.....	.....	
60,000	.001800	.000250	0.	—.000050	
61,000	.005350	.003550	.....	.....	
62,000	.005750	.000400	.....	.....	
63,000	.006150	.000400	.....	.....	
64,000	.007100	.000950	.....	.....	
65,000	.008000	.000900	.005750	.004750	
89,200	.....	.....	.....	.....	Ultimate strength.

General summary.

it per square inch of original section	pounds..	57,000
n per inch under stress at elastic limit	inch..	0.001850
rength per square inch of original section	pounds..	89,200
failure		triple flexure

No. 574.

Marks, N E X.
Length, 3″.94.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001050	.000150	0.	.....	
20,000	40,000	.001200	.000150	.000050	.000050	
22,500	45,000	.001400	.000200	.000050	0.	
25,000	50,000	.001600	.000200	.000100	.000050	
25,500	51,000	.001650	.000050	.....	.....	
26,000	52,000	.001700	.000050	.....	.....	
26,500	53,000	.001750	.000050	.....	.....	Elastic limit.
27,000	54,000	.001850	.000100	.....	.....	
27,500	55,000	.002000 .008000	.000150 .006000	.006050	.005950	
28,000	56,000	.009200	.001200	.....	.....	
28,500	57,000	.009600	.000400	.....	.....	
29,000	58,000	.009950	.000350	.....	.....	
29,500	59,000	.010400	.000450	.....	.....	
30,000	60,000	.010800	.000400	.008700	.002650	
50,800	101,600	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section ..... pounds.. 53,000
Compression per inch under stress at elastic limit ..... inch.. 0.001750
Ultimate strength per square inch of original section ..... pounds.. 101,600
Manner of failure ..... triple flexure

No. 575.

ks, P E X.
gth, 3″.94.
neter, ″.798.
ional area, .50 square inch.

plied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
l.	Per square inch.					
ts.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	0.	0.	Initial load.
0	5,000	.000150	.000150	0.	.....	
0	10,000	.000300	.000150	0.	.....	
0	15,000	.000450	.000150	0.	.....	
0	20,000	.000600	.000150	0.	.....	
0	25,000	.000750	.000150	0.	.....	
0	30,000	.000900	.000150	0.	.....	
0	35,000	.001050	.000150	0.	.....	
0	40,000	.001200	.000150	0.	.....	
0	45,000	.001350	.000150	0.	.....	
0	50,000	.001500	.000150	0.	.....	
0	51,000	.001500	0.	.....	.....	
0	52,000	.001550	.000050	.....	.....	
0	53,000	.001550	0.	.....	.....	
0	54,000	.001600 .005800	.000050 .004200	.....	.....	Elastic limit.
0	55,000	.006800	.001000	.004800	.004800	
0	56,000	.007600	.000800	.....	.....	
0	57,000	.008500	.000900	.....	.....	
0	58,000	.009250	.000750	.....	.....	
0	59,000	.010300	.001050	.....	.....	
0	60,000	.011300	.001000	.008950	.004150	
0	101,600	.....	.....	.....	.....	Ultimate strength.

General summary.

nit per square inch of original section	pounds..	54,000
ion per inch under stress at elastic limit	inch..	0.001600
strength per square inch of original section	pounds..	101,600
f failure		triple flexure

No. 1671.

Marks, II E X_1
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000267	.000134	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000633	.000200	0.	.....	
6,250	25,000	.000767	.000134	0.	.....	
7,500	30,000	.000900	.000133	0.	.....	
8,750	35,000	.001033	.000133	0.	.....	
10,000	40,000	.001200	.000167	0.	.....	
11,250	45,000	.001333	.000133	0.	.....	
11,500	46,000	.001367	.000034	.....	.....	
11,750	47,000	.001400	.000033	.....	.....	
12,000	48,000	.001467	.000067	.....	.....	
12,250	49,000	.001500	.000033	.....	.....	
12,500	50,000	.001533	.000033	0.	.....	
12,750	51,000	.001567	.000034	.....	.....	
13,000	52,000	.001633	.000066	.....	.....	
13,250	53,000	.001667	.000034	.....	.....	
13,500	54,000	.001700	.000033	.....	.....	
13,750	55,000	.001733	.000033	0.	.....	
14,000	56,000	.001767	.000034	.....	.....	
14,250	57,000	.001833	.000066	.....	.....	Elastic limit.
14,500	58,000	.003500	.001667	.....	.....	
14,750	59,000	.004667	.001167	.....	.....	
15,000	60,000	.005767	.001100	.003567	.003567	
15,500	62,000	.007333	.001566	.....	.....	
16,000	64,000	.009167	.001834	.....	.....	
16,500	66,000	.011000	.001833	.....	.....	
17,000	68,000	.012733	.001733	.....	.....	
17,500	70,000	.014567	.001834	.....	.....	
18,000	72,000	.016500	.001933	.....	.....	
18,500	74,000	.018500	.002000	.....	.....	
19,000	76,000	.020567	.002067	.....	.....	
19,500	78,000	.022733	.002166	.....	.....	
20,000	80,000	.025333	.002600	.....	.....	
20,500	82,000	.028033	.002700	.....	.....	
21,000	84,000	.031500	.003467	.....	.....	
21,500	86,000	.034167	.002667	.....	.....	
22,000	88,000	.037567	.003400	.....	.....	
22,500	90,000	.041667	.004100	.....	.....	
23,000	92,000	.046500	.004833	.....	.....	
23,500	94,000	.052833	.006333	.....	.....	
24,000	96,000	.0600	.007167	.....	.....	
24,500	98,000	.0700	.0100	.....	.....	
25,000	100,000	.1033	.0333	.....	.....	
25,030	100,120	.1267	.0234	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds.. 100,120
Elastic limit per square inch of original section ..... do... 57,000
Elongation per inch after rupture ..... inch.. 0.21
Elongation per inch under strain at elastic limit ..... do... .00
Reduction in diameter at point of rupture ..... do... .14
Reduction in area after rupture, per centum of original section 44.6
Position of rupture ..... ".95 from rock
Character of broken surface ..... granular at circumference; dull silky center
Elongation of inch sections ..... ".30+, ".18, ".15

No. 1673.

, H E X,
ter, ".564.
ıal area, .25 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000100	.000100	0.	.....	
10,000	.000267	.000167	0.	.....	
15,000	.000433	.000166	0.	.....	
20,000	.000600	.000167	0.	.....	
25,000	.000767	.000167	0.	.....	
30,000	.000933	.000166	0.	.....	
35,000	.001100	.000167	0.	.....	
40,000	.001267	.000167	0.	.....	
45,000	.001367	.000100	0.	.....	
50,000	.001533	.000166	0.	.....	
51,000	.001567	.000034	.....	.....	
52,000	.001600	.000033	.....	.....	
53,000	.001633	.000033	.....	.....	Elastic limit.
54,000	.001733	.000100	.....	.....	
55,000	.001900	.000167	.....	.....	
	.013367	.011467	.011233	.011233	
56,000	.014200	.000833	.....	.....	
57,000	.014567	.000367	.....	.....	
58,000	.015633	.001066	.....	.....	
59,000	.016200	.000567	.....	.....	
60,000	.017233	.001033	.014700	.003467	
62,000	.018733	.001500	.....	.....	
64,000	.020867	.002134	.....	.....	
66,000	.023333	.002466	.....	.....	
68,000	.025667	.002334	.....	.....	
70,000	.028200	.002533	.....	.....	
72,000	.031000	.002800	.....	.....	
74,000	.034033	.003033	.....	.....	
76,000	.037767	.003734	.....	.....	
78,000	.041500	.003733	.....	.....	
80,000	.045667	.004167	.....	.....	
82,000	.0500	.004333	.....	.....	
84,000	.0567	.0067	.....	.....	
86,000	.0667	.0100	.....	.....	
88,000	.0767	.0100	.....	.....	
90,000	.0900	.0133	.....	.....	
92,000	.1200	.0300	.....	.....	
93,040	.1633	.0433	.....	.....	Tensile strength.

General summary.

ıgth per square inch of original section	pounds..	93,040
per square inch of original section	do...	53,000
er inch after rupture	inch..	0.2233
er inch under strain at elastic limit	do...	.001633
ı diameter at point of rupture	do...	.124
ı area after rupture, per centum of original section		39.2
upture		".85 from neck
broken surface		silky
f inch sections		".34*, ".17, ".16

, Ex. 31——76.

No. 1672.

Marks, J E X_1
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000233	.000133	0.	.....	
3,750	15,000	.000333	.000100	0.	.....	
5,000	20,000	.000533	.000200	0.	.....	
6,250	25,000	.000667	.000134	0.	.....	
7,500	30,000	.000833	.000166	0.	.....	
8,750	35,000	.001000	.000167	0.	.....	
10,000	40,000	.001167	.000167	0.	.....	
11,250	45,000	.001300	.000133	0.	.....	
11,500	46,000	.001333	.000033	.....	.....	
11,750	47,000	.001367	.000034	.....	.....	
12,000	48,000	.001400	.000033	.....	.....	
12,250	49,000	.001433	.000033	.....	.....	
12,500	50,000	.001500	.000067	0.	.....	
12,750	51,000	.001533	.000033	.....	.....	
13,000	52,000	.001600	.000067	.....	.....	
13,250	53,000	.001633	.000033	.....	.....	
13,500	54,000	.001667	.000034	.....	.....	
13,750	55,000	.001667	0.	0.	.....	
14,000	56,000	.001700	.000033	.....	.....	
14,250	57,000	.001733	.000033	.....	.....	
14,500	58,000	.001767	.000034	.....	.....	
14,750	59,000	.001800	.000033	.....	.....	
15,000	60,000	.001933	.000133	.000067	.000067	Elastic limit.
15,250	61,000	.002100	.000467	.....	.....	
15,500	62,000	.004067	.001667	.....	.....	
15,750	63,000	.004833	.000766	.....	.....	
16,000	64,000	.006867	.002034	.....	.....	
16,250	65,000	.007333	.000466	.....	.....	
16,500	66,000	.007900	.000567	.....	.....	
17,000	68,000	.009533	.001633	.....	.....	
17,500	70,000	.011700	.002167	.....	.....	
18,000	72,000	.014033	.002333	.....	.....	
18,500	74,000	.015133	.001100	.....	.....	
19,000	76,000	.016767	.001634	.....	.....	
19,500	78,000	.019433	.002666	.....	.....	
20,000	80,000	.020400	.000967	.....	.....	
20,500	82,000	.023333	.002933	.....	.....	
21,000	84,000	.025400	.002067	.....	.....	
21,500	86,000	.027667	.002267	.....	.....	
22,000	88,000	.030700	.003033	.....	.....	
22,500	90,000	.033433	.002733	.....	.....	
23,000	92,000	.037100	.003667	.....	.....	
23,500	94,000	.041000	.003900	.....	.....	
24,000	96,000	.0433	.0023	.....	.....	
24,500	98,000	.0500	.0067	.....	.....	
25,000	100,000	.0567	.0067	.....	.....	
25,500	102,000	.0700	.0133	.....	.....	
26,000	104,000	.0967	.0267	.....	.....	
26,040	104,160	.1233	.0266	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds..
Elastic limit per square inch of original section ..... do...
Elongation per inch after rupture ..... inch..
Elongation per inch under strain at elastic limit ..... do...
Reduction in diameter at point of rupture ..... do...
Reduction in area after rupture, per centum of original section .....
Position of rupture ..... ".45 fr
Character of broken surface ..... granular, radiating from dull colored metal at circu
Diameter ..... ¼" from point of rupt
Elongation of inch sections ..... ".28*,

No. 1674.

Marks, J E X_2
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000200	.000100	0.	.....	
3,750	15,000	.000367	.000167	0.	.....	
5,000	20,000	.000533	.000166	0.	.....	
6,250	25,000	.000700	.000167	0.	.....	
7,500	30,000	.000867	.000167	0.	.....	
8,750	35,000	.001033	.000166	0.	.....	
10,000	40,000	.001200	.000167	0.	.....	
11,250	45,000	.001333	.000133	.....	.....	
11,500	46,000	.001367	.000034	.....	.....	
11,750	47,000	.001400	.000033	.....	.....	Elastic limit.
12,000	48,000	.003733	.002333	.....	.....	
12,250	49,000	.007167	.003434	.....	.....	
12,500	50,000	.009933	.002766	.007900	.007900	
12,750	51,000	.010533	.000600	.....	.....	
13,000	52,000	.011100	.000567	.....	.....	
13,250	53,000	.011633	.000533	.....	.....	
13,500	54,000	.012933	.001300	.....	.....	
13,750	55,000	.013733	.000800	.011500	.003600	
14,000	56,000	.014433	.000700	.....	.....	
14,250	57,000	.014900	.000467	.....	.....	
14,500	58,000	.015700	.000800	.....	.....	
14,750	59,000	.016667	.000967	.....	.....	
15,000	60,000	.017733	.001066	.015200	.003700	
15,500	62,000	.019333	.001600	.....	.....	
16,000	64,000	.021500	.002167	.....	.....	
16,500	66,000	.023733	.002233	.....	.....	
17,000	68,000	.025833	.002100	.....	.....	
17,500	70,000	.028233	.002400	.....	.....	
18,000	72,000	.031033	.002800	.....	.....	
18,500	74,000	.034000	.002967	.....	.....	
19,000	76,000	.036900	.002900	.....	.....	
19,500	78,000	.040667	.003767	.....	.....	
20,000	80,000	.044667	.004000	.....	.....	
20,500	82,000	.049333	.004666	.....	.....	
21,000	84,000	.054667	.005334	.....	.....	
21,500	86,000	.061333	.006666	.....	.....	
22,000	88,000	.0733	.011967	.....	.....	
22,500	90,000	.0833	.0100	.....	.....	
23,000	92,000	.1000	.0167	.....	.....	
23,290	93,160	.1333	.0333	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,160
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	0.1767
Elongation per inch under strain at elastic limit	do...	.0014
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		¼" from middle of stem
Character of broken surface		silky, interspersed with granular metal
Elongation of inch sections		".14, ".30*, ".09

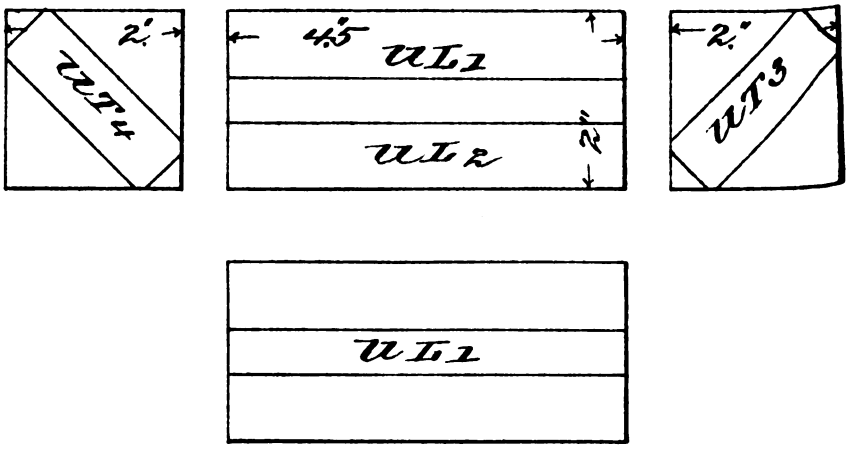
TESTS OF STEEL WIRE ".15 SQUARE USED IN GUN CONSTRUCTION.

1205.

L.

Top wire billet of ingot No. 1

Lot No. 3



H Ex 31 49 2

OF STEEL FROM UPPER END OF TOP WIRE BILLET, INGOT No. 1, LOT No 3.

No. 2771.

S, $\frac{3\ W_1}{U\ L_1}$
eter, ".504.
onal area, .20 square inch.

lied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.000150	.000150	0.	.....	
10,000	.000400	.000250	0.	.....	
15,000	.000600	.000200	0.	.....	
20,000	.000850	.000250	0.	.....	
25,000	.001050	.000200	0.	.....	
30,000	.001250	.000200	0.	.....	
35,000	.001450	.000200	.....	.....	
40,000	.001650	.000200	.....	.....	
41,000	.001650	0.	.....	.....	
42,000	.001700	.000050	.....	.....	
43,000	.001750	.000050	.....	.....	Elastic limit.
44,000	.018000	.016250	.....	.....	
45,000	.019000	.001000	.....	.....	
46,000	.019700	.000700	.....	.....	
47,000	.020650	.000950	.....	.....	
48,000	.021850	.001200	.....	.....	
49,000	.023600	.001750	.....	.....	
50,000	.025250	.001650	.....	.....	
52,000	.028000	.002750	.....	.....	
54,000	.031750	.003750	.....	.....	
56,000	.036500	.004750	.....	.....	
58,000	.041000	.004500	.....	.....	
60,000	.046500	.005500	.....	.....	
62,000	.0525	.0060	.....	.....	
64,000	.0600	.0075	.....	.....	
66,000	.0700	.0100	.....	.....	
68,000	.0850	.0150	.....	.....	
70,000	.1000	.0150	.....	.....	
72,000	.1400	.0400	.....	.....	
73,500	.1950	.0550	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds..	73,500
it per square inch of original section	do...	43,000
per inch after rupture	inch..	0.3400
per inch under strain at elastic limit	do...	.00175
in diameter at point of rupture	do...	.164
in area after rupture, per centum of original section		54.6
rupture		1".20 from neck
f broken surface		fine silky
of inch sections		".28, ".40*

No. 2772.

Marks, $\frac{3\,W_1}{U\,L_2}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000200	.000200	0.	.....	
2,000	10,000	.000400	.000200	0.	.....	
3,000	15,000	.000550	.000150	0.	.....	
4,000	20,000	.000700	.000150	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001200	.000150	.....	.....	
8,000	40,000	.001400	.000200	.....	.....	
8,200	41,000	.001450	.000050	.....	.....	
8,400	42,000	.001500	.000050	.....	.....	Elastic limit.
8,600	43,000	.005300	.003800	.....	.....	
8,800	44,000	.018000	.012700	.....	.....	
9,000	45,000	.019050	.001050	.....	.....	
9,200	46,000	.020000	.000950	.....	.....	
9,400	47,000	.020800	.000800	.....	.....	
9,600	48,000	.022550	.001750	.....	.....	
9,800	49,000	.023900	.001350	.....	.....	
10,000	50,000	.025500	.001600	.....	.....	
10,400	52,000	.028550	.003050	.....	.....	
10,800	54,000	.032350	.003800	.....	.....	
11,200	56,000	.036750	.004400	.....	.....	
11,600	58,000	.041300	.004550	.....	.....	
12,000	60,000	.046550	.005250	.....	.....	
12,400	62,000	.053250	.006700	.....	.....	
12,800	64,000	.060500	.007250	.....	.....	
13,200	66,000	.0700	.0095	.....	.....	
13,600	68,000	.0850	.0150	.....	.....	
14,000	70,000	.1000	.0150	.....	.....	
14,400	72,000	.1250	.0250	.....	.....	
14,760	73,800	.1950	.0700	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	73,800
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch..	0.3400
Elongation per inch under strain at elastic limit	do...	.0015
Reduction in diameter at point of rupture	do...	.165
Reduction in area after rupture, per centum of original section	do...	54.6
Position of rupture		at middle of stem
Character of broken surface		fine silky
Elongation of inch sections		″.34*, ″.34*

No. 2773.

ɜ, $\overset{3\,W_1}{U\,T_1}$,
ɜter, ″.320.
ɔnal area, .08 square inch.

ied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
5,000	.0001	.0001	.....	.....	
10,000	.0002	.0001	.....	.....	
15,000	.0003	.0001	.....	.....	
20,000	.0005	.0002	.....	.....	
25,000	.0007	.0002	.....	.....	
30,000	.0009	.0002	.....	.....	
35,000	.0010	.0001	.....	.....	
36,000	.0011	.0001	.....	.....	Elastic limit.
37,000	.0018	.0007	.....	.....	
38,000	.0030	.0012	.....	.....	
39,000	.0049	.0019	.....	.....	
40,000	.0163	.0114	.....	.....	
41,000	.0172	.0009	.....	.....	
42,000	.0187	.0015	.....	.....	
43,000	.0198	.0011	.....	.....	
44,000	.0215	.0017	.....	.....	
45,000	.0230	.0015	.....	.....	
46,000	.0251	.0021	.....	.....	
47,000	.0270	.0019	.....	.....	
48,000	.0285	.0015	.....	.....	
49,000	.0298	.0013	.....	.....	
50,000	.0317	.0019	.....	.....	
52,000	.0350	.0033	.....	.....	
54,000	.0407	.0057	.....	.....	
56,000	.0470	.0063	.....	.....	
58,000	.0528	.0058	.....	.....	
60,000	.0619	.0091	.....	.....	
62,000	.065	.0031	.....	.....	
64,000	.075	.010	.....	.....	
66,000	.09	.015	.....	.....	
68,000	.11	.020	.....	.....	
70,000	.145	.035	.....	.....	
71,500	.225	.080	.....	.....	Tensile strength.

General summary.

ɜngth per square inch of original section	pounds..	71,500
t per square inch of original section	do...	36,000
per inch after rupture	inch..	0.30
per inch under strain at elastic limit	do...	.0011
n diameter at point of rupture	do...	.027
n area after rupture, per centum of original section		33.7
rupture		″.65 from neck
f broken surface		silky; serrated

No. 2776.

Marks, $^{3}_{U}\,W_{1}^{T_4}$
Diameter, ″.320.
Sectional area, .08 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
80	1,000	0.	0.	0.	0.	Initial load.
400	5,000	.0001	.0001	.....	.....	
800	10,000	.0002	.0001	.....	.....	
1,200	15,000	.0003	.0001	.....	.....	
1,600	20,000	.0005	.0002	.....	.....	
2,000	25,000	.0007	.0002	.....	.....	
2,400	30,000	.0009	.0002	.....	.....	
2,800	35,000	.0011	.0002	.....	.....	
2,880	36,000	.0011	0.	.....	.....	
2,960	37,000	.0012	.0001	.....	.....	Elastic limit.
3,040	38,000	.0016	.0004	.....	.....	
3,120	39,000	.0040	.0024	.....	.....	
3,200	40,000	.0160	.0120	.....	.....	
3,280	41,000	.0171	.0011	.....	.....	
3,360	42,000	.0180	.0009	.....	.....	
3,440	43,000	.0195	.0015	.....	.....	
3,520	44,000	.0213	.0018	.....	.....	
3,600	45,000	.0226	.0013	.....	.....	
3,680	46,000	.0245	.0019	.....	.....	
3,760	47,000	.0260	.0015	.....	.....	
3,840	48,000	.0275	.0015	.....	.....	
3,920	49,000	.0294	.0019	.....	.....	
4,000	50,000	.0317	.0023	.....	.....	
4,160	52,000	.0352	.0035	.....	.....	
4,320	54,000	.0404	.0052	.....	.....	
4,480	56,000	.0472	.0068	.....	.....	
4,640	58,000	.0517	.0045	.....	.....	
4,800	60,000	.0610	.0093	.....	.....	
4,960	62,000	.0700	.0090	.....	.....	
5,120	64,000	.0900	.0200	.....	.....	
5,280	66,000	.10	.010	.....	.....	
5,440	68,000	.115	.015	.....	.....	
5,600	70,000	.155	.040	.....	.....	
5,680	71,000	.225	.070	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	71,[illegible]
Elastic limit per square inch of original section	do	37,[illegible]
Elongation per inch after rupture	inch	0.27
Elongation per inch under strain at elastic limit	do	.00[illegible]
Reduction in diameter at point of rupture	do	.02[illegible]
Reduction in area after rupture, per centum of original section		33.7
Position of rupture		″.65 from [illegible]
Character of broken surface		silky; serrat[illegible]

SQUARE STEEL WIRE SPECIMENS FROM TWENTY SELECTED BILLETS.

[See Report of Chief of Ordnance, U. S. Army, 1885, Appendix 43.]

Square steel wire.

ıds of samples remote from end of coil were bent around an arbor diameter.
ınsile tests made on section of wire next that used for the bending ing) test.
ires straightened between rolls before testing.

No. 2302.

ırk, I
ctional area, ″.1496×″.1494 = .02235 square inch.
uged length, 10″.

pplied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
al.	Per square inch.					
ıds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
224	10,000	.000220	.000220	.....	.....	
335	15,000	.000360	.000140	.....	.....	
447	20,000	.000580	.000220	.000040	.000040	
559	25,000	.000710	.000130	.....	.....	
671	30,000	.000880	.000170	.....	.....	
782	35,000	.001090	.000210	.....	.....	
894	40,000	.001280	.000190	.000080	.000040	
006	45,000	.001480	.000200	.....	.....	
118	50,000	.001700	.000220	.....	.....	
229	55,000	.001940	.000240	.....	.....	
341	60,000	.002140	.000200	.000180	.000100	
453	65,000	.002380	.000240	.....	.....	
565	70,000	.002610	.000230	.....	.....	
676	75,000	.002850	.000240	.....	.....	
788	80,000	.003120	.000270	.000320	.000140	
900	85,000	.003390	.000270	.....	.....	
012	90,000	.003630	.000240	.....	.....	
123	95,000	.003930	.000300	.....	.....	
235	100,000	.004210	.000280	.000610	.000290	
347	105,000	.004580	.000370	.....	.....	
459	110,000	.004950	.000370	.....	.....	
570	115,000	.005400	.000450	.....	.....	
682	120,000	.005850	.000450	.001280	.000670	
794	125,000	.006250	.000400	.....	.....	
906	130,000	.006820	.000570	.....	.....	
017	135,000	.007500	.000680	.....	.....	
129	140,000	.008280	.000780	.002750	.001470	
241	145,000	.009150	.000870	.....	.....	
353	150,000	.010250	.001100	.....	.....	
595	160,850	.....	.....	.....	.....	Tensile strength.

General summary.

strength per square inch of original section.....pounds.. 160,850
ion per inch after rupture.....inch.. .009
ions at point of rupture.....″.137 × ″.137
on in area after rupture, per centum of original section..... 16.0
of rupture .....5¼″ outside the gauged length
er of broken surface.....fine silky

No. 2303.

Mark, II.
Sectional area, ".1488×".1492=.0222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000220	.000220	.....	.....	
333	15,000	.000400	.000180	.....	.....	
444	20,000	.000590	.000190	.000020	.000020	
555	25,000	.000790	.000200	.....	.....	
666	30,000	.001000	.000210	.....	.....	
777	35,000	.001200	.000200	.....	.....	
888	40,000	.001420	.000220	.000100	.000080	
999	45,000	.001620	.000200	.....	.....	
1,110	50,000	.001830	.000210	.....	.....	
1,221	55,000	.002040	.000210	.....	.....	
1,332	60,000	.002250	.000210	.000180	.000080	
1,443	65,000	.002480	.000230	.....	.....	
1,554	70,000	.002710	.000230	.....	.....	
1,665	75,000	.002980	.000270	.....	.....	
1,776	80,000	.003210	.000230	.000260	.000180	
1,887	85,000	.003480	.000270	.....	.....	
1,998	90,000	.003730	.000250	.....	.....	
2,109	95,000	.004050	.000320	.....	.....	
2,220	100,000	.004400	.000350	.000720	.000460	
2,331	105,000	.004700	.000300	.....	.....	
2,442	110,000	.005050	.000350	.....	.....	
2,553	115,000	.005480	.000430	.....	.....	
2,664	120,000	.005920	.000440	.001400	.000680	
2,775	125,000	.006440	.000520	.....	.....	
2,886	130,000	.007030	.000590	.....	.....	
2,997	135,000	.007700	.000670	.....	.....	
3,108	140,000	.008600	.000900	.....	.....	
3,219	145,000	.009610	.001010	.....	.....	
3,330	150,000	.010840	.001230	.....	.....	
3,441	155,000	.013000	.002160	.....	.....	
3,592	161,800	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	161,800
Elongation per inch after rupture	inch	.009
Dimensions at point of rupture	do	".130×".130
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		3".8 outside the gauged length
Character of broken surface		fine silky

No. 2304.

rk, III.

tional area, ″.1488×″.1492=.0222 square inch.

plied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.000160	.000160	.....	.....	
15,000	.000350	.000190	.....	.....	
20,000	.000540	.000190	—.000010	—.000010	
25,000	.000740	.000200	.....	.....	
30,000	.001040	.000300	.....	.....	
35,000	.001240	.000200	.....	.....	
40,000	.001440	.000200	.000040	.000050	
45,000	.001640	.000200	.....	.....	
50,000	.001840	.000200	.....	.....	
55,000	.002050	.000210	.....	.....	
60,000	.002260	.000210	.000110	.000070	
65,000	.002390	.000130	.....	.....	
70,000	.002600	.000210	.....	.....	
75,000	.002760	.000160	.....	.....	
80,000	.003090	.000330	.000290	.000180	
85,000	.003320	.000230	.....	.....	
90,000	.003600	.000280	.....	.....	
95,000	.003910	.000310	.....	.....	
100,000	.004210	.000300	.000570	.000280	
105,000	.004600	.000390	.....	.....	
110,000	.005000	.000400	.....	.....	
115,000	.005380	.000380	.....	.....	
120,000	.005810	.000430	.001260	.000690	
125,000	.006310	.000500	.....	.....	
130,000	.006940	.000630	.....	.....	
135,000	.007690	.000750	.....	.....	
140,000	.008450	.000760	.002880	.001620	
145,000	.009430	.000980	.....	.....	
150,000	.010700	.001270	.....	.....	
155,000	.013380	.002680	.....	.....	
159,730	.....	.....	.....	.....	Tensile strength.

General summary.

ıgth per square inch of original section	pounds..	159,730
er inch after rupture	inch..	.006
ıt point of rupture		″.132×″.132
area after rupture, per centum of original section		21.5
ıpture		5″.6 outside the gauged length
broken surface		fine silky

No. 2305.

Mark, IV.
Sectional area, ″.1499×″.1498=.02245 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
224	10,000	.000200	.000200	.....	.....	
337	15,000	.000380	.000180	.....	.....	
449	20,000	.000570	.000190	.000030	.000030	
561	25,000	.000770	.000200	.....	.....	
673	30,000	.000970	.000200	.....	.....	
786	35,000	.001170	.000200	.....	.....	
898	40,000	.001370	.000200	.000080	.000050	
1,010	45,000	.001570	.000200	.....	.....	
1,122	50,000	.001770	.000200	.....	.....	
1,235	55,000	.001970	.000200	.....	.....	
1,347	60,000	.002180	.000210	.000170	.000090	
1,459	65,000	.002420	.000240	.....	.....	
1,571	70,000	.002650	.000230	.....	.....	
1,684	75,000	.002860	.000210	.....	.....	
1,796	80,000	.003120	.000260	.000340	.000170	
1,908	85,000	.003350	.000230	.....	.....	
2,020	90,000	.003630	.000280	.....	.....	
2,133	95,000	.003930	.000300	.....	.....	
2,245	100,000	.004240	.000310	.000640	.000300	
2,357	105,000	.004540	.000300	.....	.....	
2,470	110,000	.004860	.000320	.....	.....	
2,582	115,000	.005290	.000430	.....	.....	
2,694	120,000	.005760	.000470	.001270	.000630	
2,806	125,000	.006180	.000420	.....	.....	
2,919	130,000	.006730	.000550	.....	.....	
3,031	135,000	.007380	.000650	.....	.....	
3,143	140,000	.008220	.000840	.002780	.001510	
3,255	145,000	.009020	.000800	.....	.....	
3,368	150,000	.010230	.001210	.....	.....	
3,480	155,000	.011860	.001630	.....	.....	
3,735	166,370	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	166,370
Elongation per inch after rupture	inch..	.015
Dimensions at rupture		″.133×″.133
Reduction in area after rupture, per centum of original section		21.2
Position of rupture		1½″ outside the gauged length
Character of broken surface		fine silky

No. 2306.

V.

nal area, ″.1504 × ″.1505 = .0226 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.000160	.000160	.....	.....	
15,000	.000360	.000200	.....	.....	
20,000	.000550	.000190	0.	.....	
25,000	.000730	.000180	.....	.....	
30,000	.000890	.000160	.....	.....	
35,000	.001090	.000200	.....	.....	
40,000	.001290	.000200	0.	.....	
45,000	.001490	.000200	.....	.....	
50,000	.001690	.000200	.....	.....	
55,000	.001890	.000200	.....	.....	
60,000	.002100	.000210	.000100	.000100	
65,000	.002310	.000240	.....	.....	
70,000	.002570	.000230	.....	.....	
75,000	.002820	.000250	.....	.....	
80,000	.003070	.000250	.000260	.000160	
85,000	.003290	.000220	.....	.....	
90,000	.003560	.000270	.....	.....	
95,000	.003840	.000280	.....	.....	
100,000	.004140	.000300	.000560	.000300	
105,000	.004410	.000270	.....	.....	
110,000	.004770	.000360	.....	.....	
115,000	.005210	.000440	.....	.....	
120,000	.005660	.000450	.001160	.000600	
125,000	.006150	.000490	.....	.....	
130,000	.006650	.000500	.....	.....	
135,000	.007320	.000670	.....	.....	
140,000	.007970	.000650	.002540	.001380	
145,000	.008790	.000820	.....	.....	
150,000	.009790	.001000	.....	.....	
155,000	.011110	.001320	.....	.....	
170,710	.....	.....	.....	.....	Tensile strength.

General summary.

gth per square inch of original section	pounds..	170,710
inch sections	inch..	.013
t point of rupture		″.142 × ″.142
area after rupture, per centum of original section		10.8
pture	5½″ outside the gauged length	
roken surface	fine silky	

No. 2307.

Mark, VI.
Sectional area, ".1488×".1496=.02226 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000160	.000160	.....	.....	
334	15,000	.000360	.000200	.....	.....	
445	20,000	.000540	.000180	0.	.....	
557	25,000	.000740	.000200	.....	.....	
668	30,000	.000940	.000200	.....	.....	
779	35,000	.001130	.000190	.....	.....	
890	40,000	.001310	.000210	.000060	.000060	
1,002	45,000	.001550	.000210	.....	.....	
1,113	50,000	.001750	.000200	.....	.....	
1,224	55,000	.001950	.000200	.....	.....	
1,336	60,000	.002190	.000240	.000140	.000080	
1,447	65,000	.002430	.000240	.....	.....	
1,558	70,000	.002660	.000230	.....	.....	
1,670	75,000	.002950	.000290	.....	.....	
1,781	80,000	.003190	.000240	.000360	.000220	
1,892	85,000	.003470	.000280	.....	.....	
2,003	90,000	.003780	.000310	.....	.....	
2,115	95,000	.004120	.000340	.....	.....	
2,226	100,000	.004470	.000350	.000820	.000460	
2,337	105,000	.004920	.000450	.....	.....	
2,449	110,000	.005400	.000480	.....	.....	
2,560	115,000	.005920	.000520	.....	.....	
2,671	120,000	.006540	.000620	.001940	.001120	
2,783	125,000	.007200	.000660	.....	.....	
2,894	130,000	.007850	.000650	.....	.....	
3,005	135,000	.008830	.000980	.....	.....	
3,116	140,000	.010140	.001310	.004500	.002560	
3,228	145,000	.011700	.001560	.....	.....	
3,499	157,190	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	157,190
Elongation per inch after rupture	inch	.014
Dimensions at point of rupture		".127×".127
Reduction in area after rupture, per centum of original section		27.5
Position of rupture		6½" outside the gauged length
Character of broken surface		fine silky

No. 2308.

VII.

nal area, ″.1482×″.1487=.02207 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.000150	.000150	.....	.....	
15,000	.000360	.000210	.....	.....	
20,000	.000530	.000170	—.000010	—.000010	
25,000	.000710	.000180	.....	.....	
30,000	.000910	.000200	.....	.....	
35,000	.001110	.000200	.....	.....	
40,000	.001310	.000200	.000020	.000030	
45,000	.001510	.000200	.....	.....	
50,000	.001710	.000200	.....	.....	
55,000	.001910	.000200	.....	.....	
60,000	.002150	.000240	.000090	.000070	
65,000	.002320	.000170	.....	.....	
70,000	.002590	.000270	.....	.....	
75,000	.002840	.000290	.....	.....	
80,000	.003080	.000240	.000230	.000140	
85,000	.003350	.000270	.....	.....	
90,000	.003650	.000300	.....	.....	
95,000	.003970	.000320	.....	.....	
100,000	.004290	.000320	.000660	.000430	
105,000	.004650	.000360	.....	.....	
110,000	.005050	.000400	.....	.....	
115,000	.005470	.000420	.....	.....	
120,000	.005950	.000480	.001450	.000790	
125,000	.006470	.000520	.....	.....	
130,000	.007010	.000540	.....	.....	
135,000	.007710	.000700	.....	.....	
140,000	.008520	.000810	.003030	.001580	
145,000	.009410	.000890	.....	.....	
150,000	.010400	.000990	.....	.....	
153,150	.....	.....	.....	.....	Tensile strength.

General summary.

ıgth per square inch of original section.....pounds.. 153,150
ıer inch after rupture.....inch.. .004
ıt point of rupture.....″.147×″.147
area after rupture, per centum of original section..... 2.1
upture .....3½″ outside the gauged length
broken surface.....fine silky for the sound metal
a defective spot in the corner of the wire.

No. 2309.

Mark, VIII.
Sectional area, .″1490×.″1496=.02229 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000150	.000150	.....	.....	
334	15,000	.000350	.000200	.....	.....	
446	20,000	.000540	.000190	0.	.....	
557	25,000	.000730	.000190	.....	.....	
669	30,000	.000930	.000200	.....	.....	
780	35,000	.001130	.000200	.....	.....	
892	40,000	.001330	.000200	0.	.....	
1,003	45,000	.001530	.000200	.....	.....	
1,115	50,000	.001740	.000210	.....	.....	
1,226	55,000	.001940	.000200	.....	.....	
1,337	60,000	.002150	.000210	.000040	.000040	
1,449	65,000	.002400	.000250	.....	.....	
1,560	70,000	.002630	.000230	.....	.....	
1,672	75,000	.002860	.000230	.....	.....	
1,783	80,000	.003120	.000260	.000240	.000200	
1,895	85,000	.003410	.000290	.....	.....	
2,006	90,000	.003700	.000290	.....	.....	
2,118	95,000	.004000	.000300	.....	.....	
2,229	100,000	.004370	.000370	.000610	.000370	
2,340	105,000	.004620	.000250	.....	.....	
2,452	110,000	.005090	.000470	.....	.....	
2,563	115,000	.005630	.000540	.....	.....	
2,675	120,000	.006180	.000550	.001570	.000960	
2,786	125,000	.006770	.000590	.....	.....	
2,898	130,000	.007540	.000770	.....	.....	
3,009	135,000	.008470	.000930	.....	.....	
3,120	140,000	.010050	.001580	.004400	.002830	
3,232	145,000	.011700	.001650	.....	.....	
3,308	148,410	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 148,410
Elongation per inch after rupture.....inch.. .006
Dimensions at point of rupture.....″.126×″.126
Reduction in area after rupture, per centum of original section..... 28.8
Position of rupture .....4½″ outside the gauged length
Character of broken surface .....fine silky

No. 2310.

IX.

nal area, ″.1493×″.1493=.02229 square inch.

ied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.000200	.000200	.....	.....	
15,000	.000400	.000200	.....	.....	
20,000	.000600	.000200	0.	.....	
25,000	.000800	.000200	.....	.....	
30,000	.001000	.000200	.....	.....	
35,000	.001200	.000200	.....	.....	
40,000	.001400	.000200	.000020	.000020	
45,000	.001610	.000210	.....	.....	
50,000	.001810	.000200	.....	.....	
55,000	.002030	.000220	.....	.....	
60,000	.002230	.000200	.000100	.000080	
65,000	.002480	.000250	.....	.....	
70,000	.002680	.000200	.....	.....	
75,000	.002930	.000250	.....	.....	
80,000	.003180	.000250	.000290	.000190	
85,000	.003430	.000250	.....	.....	
90,000	.003720	.000290	.....	.....	
95,000	.004020	.000300	.....	.....	
100,000	.004350	.000330	.000600	.000400	
105,000	.004670	.000320	.....	.....	
110,000	.005030	.000360	.....	.....	
115,000	.005450	.000420	.....	.....	
120,000	.005870	.000420	.001410	.000720	
125,000	.006400	.000530	.....	.....	
130,000	.006940	.000540	.....	.....	
135,000	.007570	.000630	.....	.....	
140,000	.008300	.000730	.002820	.001410	
145,000	.009170	.000870	.....	.....	
150,000	.010210	.001040	.....	.....	
166,670	.....	.....	.....	.....	Tensile strength.

General summary.

gth per square inch of original section	pounds..	166,670
r inch after rupture	inch...	.026
t point of rupture		″.136×″.136
area after rupture, per centum of original section		17.0
pture		2″ from middle of gauged length
roken surface		fine silky

No. 2311.

Mark, X.
Sectional area, ″.1490×″.1491=.02222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000200	.000200	.....	.....	
333	15,000	.000400	.000200	.....	.....	
444	20,000	.000600	.000200	0.	.....	
556	25,000	.000800	.000200	.....	.....	
667	30,000	.000990	.000190	.....	.....	
778	35,000	.001180	.000190	.....	.....	
889	40,000	.001370	.000190	0.	.....	
1,000	45,000	.001530	.000160	.....	.....	
1,111	50,000	.001730	.000200	.....	.....	
1,222	55,000	.001970	.000240	.....	.....	
1,333	60,000	.002290	.000320	.000110	.000110	
1,444	65,000	.002410	.000210	.....	.....	
1,556	70,000	.002670	.000260	.....	.....	
1,667	75,000	.002950	.000280	.....	.....	
1,778	80,000	.003220	.000270	.000350	.000240	
1,889	85,000	.003510	.000290	.....	.....	
2,000	90,000	.003820	.000310	.....	.....	
2,111	95,000	.004180	.000360	.....	.....	
2,222	100,000	.004600	.000420	.000900	.000550	
2,333	105,000	.004990	.000390	.....	.....	
2,444	110,000	.005510	.000520	.....	.....	
2,556	115,000	.006030	.000520	.....	.....	
2,667	120,000	.006710	.000680	.002040	.001140	
2,778	125,000	.007360	.000650	.....	.....	
2,889	130,000	.008160	.000800	.....	.....	
3,000	135,000	.009210	.001050	.....	.....	
3,111	140,000	.010570	.001360	.....	.....	
3,210	144,460	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	144,460
Elongation per inch after rupture	inch	.095
Dimensions at point of rupture		″.129×″.125
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		7″ outside the gauged length
Character of broken surface		fine silky

No. 2312.

k, XI.
ional area, ″.1486×″.1496=.02223 square inch.

plied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
l.	Per square inch.					
ds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1	5,000	0.	0.	0.	0.	Initial load.
2	10,000	.000180	.000180	.....	.....	
3	15,000	.000380	.000200	.....	.....	
5	20,000	.000560	.000180	0.	.....	
6	25,000	.000740	.000180	.....	.....	
7	30,000	.000900	.000160	.....	.....	
8	35,000	.001100	.000200	.....	.....	
9	40,000	.001300	.000200	0.	.....	
0	45,000	.001450	.000150	.....	.....	
2	50,000	.001620	.000170	.....	.....	
3	55,000	.001820	.000200	.....	.....	
4	60,000	.002020	.000200	.000030	.000030	
5	65,000	.002260	.000240	.....	.....	
6	70,000	.002480	.000220	.....	.....	
7	75,000	.002700	.000220	.....	.....	
8	80,000	.002950	.000250	.000170	.000140	
0	85,000	.003100	.000150	.....	.....	
1	90,000	.003430	.000330	.....	.....	
2	95,000	.003720	.000290	.....	.....	
3	100,000	.004020	.000300	.000480	.000310	
4	105,000	.004320	.000300	.....	.....	
5	110,000	.004630	.000310	.....	.....	
6	115,000	.005020	.000390	.....	.....	
8	120,000	.005420	.000400	.001020	.000540	
9	125,000	.005830	.000410	.....	.....	
0	130,000	.006270	.000440	.....	.....	
1	135,000	.006790	.000520	.....	.....	
2	140,000	.007350	.000560	.001910	.000890	
3	145,000	.007960	.000630	.....	.....	
5	150,000	.008610	.000630	.....	.....	
)	175,890	.....	.....	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds	175,890
per inch after rupture	inch	.008
s at point of rupture	do	″.136 × ″.141
in area after rupture, per centum of original section		13.7
rupture		5″ outside the gauged length
of broken surface		fine silky

No. 2313.

Mark, XII.
Sectional area, ″.1496×″.1496=.02238 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
224	10,000	.000220	.000220	.....	.....	
336	15,000	.000400	.000180	.....	.....	
448	20,000	.000590	.000190	—.000030	—.000030	
560	25,000	.000790	.000200	.....	.....	
671	30,000	.000960	.000170	.....	.....	
783	35,000	.001160	.000200	.....	.....	
895	40,000	.001360	.000200	.000040	.000070	
1,007	45,000	.001550	.000190	.....	.....	
1,119	50,000	.001750	.000200	.....	.....	
1,231	55,000	.001960	.000210	.....	.....	
1,343	60,000	.002170	.000210	.000120	.000080	
1,455	65,000	.002410	.000240	.....	.....	
1,567	70,000	.002640	.000230	.....	.....	
1,679	75,000	.002890	.000250	.....	.....	
1,790	80,000	.003140	.000250	.000310	.000190	
1,902	85,000	.003450	.000310	.....	.....	
2,014	90,000	.003680	.000230	.....	.....	
2,126	95,000	.003950	.000270	.....	.....	
2,238	100,000	.004340	.000390	.000710	.000400	
2,350	105,000	.004690	.000350	.....	.....	
2,462	110,000	.005060	.000370	.....	.....	
2,574	115,000	.005460	.000400	.....	.....	
2,686	120,000	.005970	.000510	.001470	.000760	
2,798	125,000	.006510	.000540	.....	.....	
2,909	130,000	.007080	.000570	.....	.....	
3,021	135,000	.007650	.000570	.....	.....	
3,133	140,000	.008580	.000930	.003110	.001640	
3,245	145,000	.009500	.000920	.....	.....	
3,357	150,000	.010380	.000880	.....	.....	
3,670	163,990	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	163,990
Elongation per inch after rupture	inch	.008
Dimensions at point of rupture		″.133×″.133
Reduction in area after rupture, per centum of original section		20.9
Position of rupture		5″ outside the gauged length
Character of broken surface		fine silky

No. 2314.

XIII.

nal area, ″.1495×″.1492=.02235 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.000200	.000200	.....	.....	
15,000	.000400	.000200	.....	.....	
20,000	.000590	.000190	0.	.....	
25,000	.000710	.000120	.....	.....	
30,000	.000930	.000220	.....	.....	
35,000	.001130	.000200	.....	.....	
40,000	.001330	.000200	.000030	.000030	
45,000	.001560	.000230	.....	.....	
50,000	.001730	.000170	.....	.....	
55,000	.001930	.000200	.....	.....	
60,000	.002200	.000270	.000130	.000100	
65,000	.002400	.000200	.....	.....	
70,000	.002630	.000230	.....	.....	
75,000	.002860	.000230	.....	.....	
80,000	.003150	.000290	.000250	.000120	
85,000	.003370	.000220	.....	.....	
90,000	.003670	.000300	.....	.....	
95,000	.004070	.000400	.....	.....	
100,000	.004380	.000310	.000690	.000440	
105,000	.004730	.000350	.....	.....	
110,000	.005140	.000410	.....	.....	
115,000	.005590	.000450	.....	.....	
120,000	.006080	.000490	.001530	.000840	
125,000	.006640	.000560	.....	.....	
130,000	.007230	.000590	.....	.....	
135,000	.008000	.000770	.....	.....	
140,000	.008780	.000780	.003190	.001660	
145,000	.009720	.000940	.....	.....	
150,000	.010970	.001250	.....	.....	
167,130	.....	.....	.....	.....	Tensile strength.

General summary.

gth per square inch of original section	pounds..	167,130
r inch after rupture	inch..	.024
point of rupture		″.137×″.137
rea after rupture, per centum of original section		16.0
pture		2″ inside the ganged length
roken surface		fine silky

No. 2315.

Mark, XIV.
Sectional area, ″.1494 × ″.1494 = .02232 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000210	.000210	.....	.....	
335	15,000	.000410	.000200	.....	.....	
446	20,000	.000570	.000160	.000030	.000030	
558	25,000	.000770	.000200	.....	.....	
669	30,000	.000960	.000190	.....	.....	
781	35,000	.001160	.000200	.....	.....	
893	40,000	.001340	.000180	.000050	.000020	
1,004	45,000	.001560	.000220	.....	.....	
1,116	50,000	.001740	.000180	.....	.....	
1,228	55,000	.001970	.000230	.....	.....	
1,339	60,000	.002170	.000200	.000110	.000060	
1,451	65,000	.002400	.000230	.....	.....	
1,562	70,000	.002620	.000220	.....	.....	
1,674	75,000	.002860	.000240	.....	.....	
1,786	80,000	.003120	.000260	.000280	.000170	
1,897	85,000	.003420	.000300	.....	.....	
2,009	90,000	.003660	.000240	.....	.....	
2,120	95,000	.003970	.000310	.....	.....	
2,232	100,000	.004320	.000350	.000690	.000410	
2,344	105,000	.004670	.000350	.....	.....	
2,455	110,000	.005030	.000360	.....	.....	
2,567	115,000	.005480	.000450	.....	.....	
2,678	120,000	.005990	.000510	.001460	.000770	
2,790	125,000	.006530	.000540	.....	.....	
2,902	130,000	.007040	.000510	.....	.....	
3,013	135,000	.007750	.000710	.....	.....	
3,125	140,000	.008680	.000930	.003150	.001690	
3,236	145,000	.009660	.000980	.....	.....	
3,348	150,000	.010900	.001240	.....	.....	
3,540	158,600	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds.. 158,600
Elongation per inch after rupture ..... inch.. .006
Dimensions at point of rupture ..... ″.130 × ″.130
Reduction in area after rupture, per centum of original section 24.3
Position of rupture ..... 5¼″ outside the gauged section
Character of broken surface ..... fine silky

No. 2316.

:, XV.

onal area, ″.1490×″.1490=.02229 square inch.

lied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
	Per square inch.					
r.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
	5,000	0.	0.	0.	0.	Initial load.
	10,000	.000200	.000200	.....	.....	
	15,000	.000370	.000170	.....	.....	
	20,000	.000550	.000180	0.	.....	
	25,000	.000730	.000180	.....	.....	
	30,000	.000930	.000200	.....	.....	
	35,000	.001020	.000090	.....	.....	
	40,000	.001320	.000300	.000070	.000070	
	45,000	.001520	.000200	.....	.....	
	50,000	.001720	.000200	.....	.....	
	55,000	.001920	.000200	.....	.....	
	60,000	.002130	.000210	.000130	.000060	
	65,000	.002380	.000250	.....	.....	
	70,000	.002610	.000230	.....	.....	
	75,000	.002870	.000260	.....	.....	
	80,000	.003090	.000220	.000300	.000170	
	85,000	.003330	.000240	.....	.....	
	90,000	.003610	.000280	.....	.....	
	95,000	.003900	.000290	.....	.....	
	100,000	.004210	.000310	.000580	.000280	
	105,000	.004590	.000380	.....	.....	
	110,000	.004960	.000370	.....	.....	
	115,000	.005380	.000420	.....	.....	
	120,000	.005900	.000520	.001400	.000840	
	125,000	.006390	.000490	.....	.....	
	130,000	.006860	.000470	.....	.....	
	135,000	.007600	.000740	.....	.....	
	140,000	.008370	.000770	.002800	.001490	
	145,000	.009260	.000890	.....	.....	
	150,000	.010460	.001200	.....	.....	
	164,200	.....	.....	.....	.....	Tensile strength.

General summary.

ength per square inch of original section	pounds..	164,200
per inch after rupture	inch..	.010
s at point of rupture		″.134×″.134
in area after rupture, per centum of original section		19.4
rupture		6½″ outside the gauged length
f broken surface		fine silky

No. 2317.

Mark, XVI.
Sectional area, ″.1489×″.1492=.02222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000200	.000200	.....	.....	
333	15,000	.000400	.000200	.....	.....	
444	20,000	.000540	.000140	0.	.....	
556	25,000	.000740	.000200	.....	.....	
667	30,000	.000940	.000200	.....	.....	
778	35,000	.001140	.000200	.....	.....	
889	40,000	.001330	.000190	.000010	.000010	
1,000	45,000	.001530	.000200	.....	.....	
1,111	50,000	.001720	.000190	.....	.....	
1,222	55,000	.001920	.000200	.....	.....	
1,333	60,000	.002130	.000210	.000100	.000090	
1,444	65,000	.002350	.000220	.....	.....	
1,556	70,000	.002600	.000250	.....	.....	
1,667	75,000	.002810	.000210	.....	.....	
1,778	80,000	.003120	.000310	.000300	.000200	
1,889	85,000	.003370	.000250	.....	.....	
2,000	90,000	.003640	.000270	.....	.....	
2,111	95,000	.003950	.000310	.....	.....	
2,222	100,000	.004310	.000360	.000640	.000340	
2,333	105,000	.004710	.000400	.....	.....	
2,444	110,000	.005060	.000350	.....	.....	
2,556	115,000	.005500	.000440	.....	.....	
2,667	120,000	.006090	.000590	.001520	.000880	
2,778	125,000	.006600	.000510	.....	.....	
2,889	130,000	.007240	.000640	.....	.....	
3,000	135,000	.008000	.000760	.....	.....	
3,111	140,000	.008900	.000900	.003330	.001810	
3,222	145,000	.010000	.001100	.....	.....	
3,333	150,000	.011220	.001220	.....	.....	
3,505	157,740	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds.. 157,740
Elongation per inch after rupture..... ..... inch.. .007
Dimensions at point of rupture ..... ″.133×″.133
Reduction in area after rupture, per centum of original section 20.4
Position of rupture..... 5¼″ outside the gauged length
Character of broken surface ..... fine silky

No. 2318.

XVII.

nal area, ″.1488×″.1488=.02214 square inch.

ied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.000200	.000200	.....	.....	
15,000	.000390	.000190	.....	.....	
20,000	.000570	.000180	.000010	.000010	
25,000	.000770	.000200	.....	.....	
30,000	.000950	.000180	.....	.....	
35,000	.001150	.000200	.....	.....	
40,000	.001350	.000200	.000020	.000010	
45,000	.001530	.000180	.....	.....	
50,000	.001740	.000210	.....	.....	
55,000	.001940	.000200	.....	.....	
60,000	.002180	.000240	.000080	.000060	
65,000	.002380	.000200	.....	.....	
70,000	.002630	.000250	.....	.....	
75,000	.002880	.000250	.....	.....	
80,000	.003130	.000250	.000270	.000190	
85,000	.003450	.000320	.....	.....	
90,000	.003740	.000290	.....	.....	
95,000	.004080	.000340	.....	.....	
100,000	.004480	.000400	.000770	.000500	
105,000	.004870	.000390	.....	.....	
110,000	.005320	.000450	.....	.....	
115,000	.005860	.000540	.....	.....	
120,000	.006390	.000530	.001780	.001010	
125,000	.007040	.000650	.....	.....	
130,000	.007710	.000670	.....	.....	
135,000	.008530	.000820	.....	.....	
140,000	.009450	.000920	.003790	.002010	
144,530	.....	.....	.....	.....	Tensile strength.

General summary.

gth per square inch of original section.....pounds.. 144,530
r inch after rupture.....inch.. .003
point of rupture..... ″.147×″.147
area after rupture, per centum of original section 2.4
ture.....4″.8 outside the gauged length
roken surface .....sound metal; fine silky. Fractured at defective spot in wire

No. 2319.

Mark, XVIII.
Sectional area, ″.1492×″.1496=.02232 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000200	.000200	.....	.....	
335	15,000	.000380	.000180	.....	.....	
446	20,000	.000580	.000200	0.	.....	
558	25,000	.000760	.000180	.....	.....	
669	30,000	.000920	.000160	.....	.....	
781	35,000	.001130	.000210	.....	.....	
893	40,000	.001330	.000200	.000030	.000030	
1,004	45,000	.001520	.000190	.....	.....	
1,116	50,000	.001720	.000200	.....	.....	
1,228	55,000	.001920	.000200	.....	.....	
1,339	60,000	.002120	.000200	.000070	.000040	
1,451	65,000	.002360	.000240	.....	.....	
1,562	70,000	.002590	.000230	.....	.....	
1,674	75,000	.002820	.000230	.....	.....	
1,786	80,000	.003070	.000250	.000240	.000170	
1,897	85,000	.003350	.000280	.....	.....	
2,009	90,000	.003610	.000260	.....	.....	
2,120	95,000	.003950	.000340	.....	.....	
2,232	100,000	.004310	.000360	.000630	.000390	
2,344	105,000	.004650	.000340	.....	.....	
2,455	110,000	.005040	.000390	.....	.....	
2,567	115,000	.005450	.000410	.....	.....	
2,678	120,000	.005990	.000540	.001450	.000820	
2,790	125,000	.006500	.000510	.....	.....	
2,902	130,000	.007130	.000630	.....	.....	
3,013	135,000	.007920	.000790	.....	.....	
3,125	140,000	.008820	.000900	.003270	.001820	
3,236	145,000	.010000	.001180	.....	.....	
3,348	150,000	.011400	.001400	.....	.....	
3,514	157,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	157,440
Elongation per inch after rupture	inch	.006
Dimensions at point of rupture		″.132×″.133
Reduction in area after rupture, per centum of original section		21.9
Position of rupture		5″ outside the gauged length
Character of broken surface		fine silky

No. 2320.

XIX.

nal area, ″.1494×″.1496=.02235 square inch.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.000200	.000200	.....	.....	
15,000	.000400	.000200	.....	.....	
20,000	.000580	.000180	0.	.....	
25,000	.000740	.000160	.....	.....	
30,000	.000890	.000150	.....	.....	
35,000	.001120	.000230	.....	.....	
40,000	.001290	.000170	.000050	.000050	
45,000	.001500	.000210	.....	.....	
50,000	.001680	.000180	.....	.....	
55,000	.001890	.000210	.....	.....	
60,000	.002090	.000200	.000080	.000030	
65,000	.002320	.000230	.....	.....	
70,000	.002530	.000210	.....	.....	
75,000	.002780	.000250	.....	.....	
80,000	.003010	.000230	.000230	.000150	
85,000	.003270	.000260	.....	.....	
90,000	.003520	.000250	.....	.....	
95,000	.003830	.000310	.....	.....	
100,000	.004170	.000340	.000560	.000330	
105,000	.004540	.000370	.....	.....	
110,000	.004890	.000350	.....	.....	
115,000	.005290	.000400	.....	.....	
120,000	.005680	.000390	.001190	.000630	
125,000	.006210	.000530	.....	.....	
130,000	.006760	.000550	.....	.....	
135,000	.007330	.000570	.....	.....	
140,000	.008070	.000740	.002620	.001430	
145,000	.008960	.000890	.....	.....	
150,000	.010070	.001110	.....	.....	
166,620	.....	.....	.....	.....	Tensile strength.

General summary.

gth per square inch of original section	pounds..	166,620
er inch after rupture	inch..	.025
t point of rupture		″.133×″.133
area after rupture, per centum of original section		20.9
pture	at middle of gauged length	
roken surface	fine silky	

No. 2321.

Mark, XX.
Sectional area, ″.1500×″.1500=.0225 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Rema
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
225	10,000	.000200	.000200	.....	.....	
338	15,000	.000370	.000170	.....	.....	
450	20,000	.000550	.000180	0.	.....	
563	25,000	.000730	.000180	.....	.....	
675	30,000	.000950	.000220	.....	.....	
788	35,000	.001120	.000170	.....	.....	
900	40,000	.001300	.000180	.000070	.000070	
1,013	45,000	.001520	.000220	.....	.....	
1,125	50,000	.001720	.000200	.....	.....	
1,237	55,000	.001960	.000240	.....	.....	
1,350	60,000	.002170	.000210	.000110	.000040	
1,463	65,000	.002400	.000230	.....	.....	
1,575	70,000	.002610	.000210	.....	.....	
1,688	75,000	.002840	.000230	.....	.....	
1,800	80,000	.003100	.000260	.000240	.000130	
1,913	85,000	.003360	.000260	.....	.....	
2,025	90,000	.003640	.000280	.....	.....	
2,138	95,000	.003930	.000290	.....	.....	
2,250	100,000	.004270	.000340	.000020	.000380	
2,363	105,000	.004610	.000340	.....	.....	
2,475	110,000	.004970	.000360	.....	.....	
2,588	115,000	.005370	.000400	.....	.....	
2,700	120,000	.005870	.000500	.001320	.000700	
2,813	125,000	.006360	.000490	.....	.....	
2,925	130,000	.006820	.000460	.....	.....	
3,038	135,000	.007580	.000760	.....	.....	
3,150	140,000	.008350	.000770	.002870	.001550	
3,263	145,000	.009150	.000800	.....	.....	
3,375	150,000	.010350	.001200	.....	.....	
3,710	164,890	.....	.....	.....	.....	Tensile stren

General summary.

Tensile strength per square inch of original section.....poun
Elongation per inch after rupture.....inc
Dimensions at point of rupture.....
Reduction in area after rupture, per centum of original section.....
Position of rupture.....4″ outside the
Character of broken surface.....

STEEL WIRE ".15 SQUARE, TINNED.

[Has received a light annealing after the fifth draught. Specimens taken from coil in the order of their test numbers.]

No. 1675.

Sectional area, ".1500×".1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000120	.000120	.....	.....	
339	15,000	.000310	.000190	.....	.....	
451	20,000	.000460	.000150	−.000030	−.000030	
564	25,000	.000640	.000180	.....	.....	
677	30,000	.000810	.000170	.....	.....	
790	35,000	.001010	.000200	.....	.....	
903	40,000	.001220	.000210	−.000030	0.	
1,016	45,000	.001410	.000190	.....	.....	
1,129	50,000	.001630	.000220	.....	.....	
1,241	55,000	.001840	.000210	.....	.....	
1,354	60,000	.002060	.000220	.000060	.000090	
1,467	65,000	.002300	.000240	.....	.....	
1,580	70,000	.002550	.000250	.....	.....	
1,693	75,000	.002840	.000290	.....	.....	
1,806	80,000	.003110	.000270	.000310	.000250	
1,918	85,000	.003410	.000300	.....	.....	
2,031	90,000	.003780	.000370	.....	.....	
2,144	95,000	.004180	.000400	.....	.....	
2,257	100,000	.004680	.000500	.001010	.000700	
2,370	105,000	.005240	.000560	.....	.....	
2,483	110,000	.005810	.000570	.....	.....	
2,596	115,000	.006710	.000900	.....	.....	
2,708	120,000	.008300	.001590	.003590	.002570	
2,821	125,000	.009940	.001640	.....	.....	
2,934	130,000	.018080	.008140	.....	.....	
2,952	130,790	.0260	.007920	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	130,790
Elongation per inch after rupture	inch..	.023
Dimensions at point of rupture		".121×".121
Reduction in area after rupture, per centum of original section		35.1
Character of broken surface		fine silky

No. 1676.

Sectional area, ″.1500×″.1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000200	.000200	.....	.....	
339	15,000	.000310	.000110	.....	.....	
451	20,000	.000500	.000190	0.	.....	
564	25,000	.000680	.000180	.....	.....	
677	30,000	.000880	.000200	.....	.....	
790	35,000	.001060	.000180	.....	.....	
903	40,000	.001220	.000160	.000060	.000060	
1,016	45,000	.001420	.000200	.....	.....	
1,129	50,000	.001630	.000210	.....	.....	
1,241	55,000	.001850	.000220	.....	.....	
1,354	60,000	.002050	.000200	.000200	.000140	
1,467	65,000	.002240	.000190	.....	.....	
1,580	70,000	.002500	.000260	.....	.....	
1,693	75,000	.002770	.000270	.....	.....	
1,806	80,000	.003000	.000230	.000360	.000160	
1,918	85,000	.003260	.000260	.....	.....	
2,031	90,000	.003560	.000280	.....	.....	
2,144	95,000	.003880	.000320	.....	.....	
2,257	100,000	.004230	.000350	.000770	.000410	
2,370	105,000	.004660	.000430	.....	.....	
2,483	110,000	.005110	.000450	.....	.....	
2,596	115,000	.005660	.000550	.....	.....	
2,708	120,000	.006420	.000760	.002000	.001230	
2,821	125,000	.007540	.001120	.....	.....	
2,934	130,000	.009870	.002330	.....	.....	
2,953	130,840	.010570	.000700	.....	.....	Tensile strength

General summary.

Tensile strength per square inch of original section.....pounds..
Elongation per inch after rupture.....inch..
Dimensions at point of rupture..... ″.
Reduction in area after rupture, per centum of original section.....
Position of rupture.....outside the gau
Character of broken surface.....

No. 1677.

Sectional area, ″.1500×″.1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000170	.000170	.....	.....	
339	15,000	.000340	.000170	.....	.....	
451	20,000	.000510	.000170	0.	.....	
564	25,000	.000670	.000160	.....	.....	
677	30,000	.000860	.000190	.....	.....	
790	35,000	.001050	.000190	.....	.....	
903	40,000	.001250	.000200	.000050	.000050	
1,016	45,000	.001460	.000210	.....	.....	
1,129	50,000	.001670	.000210	.....	.....	
1,241	55,000	.001870	.000200	.....	.....	
1,354	60,000	.002070	.000200	.000130	.000080	
1,467	65,000	.002330	.000260	.....	.....	
1,580	70,000	.002560	.000230	.....	.....	
1,693	75,000	.002830	.000270	.....	.....	
1,806	80,000	.003110	.000280	.000340	.000210	
1,918	85,000	.003360	.000250	.....	.....	
2,031	90,000	.003640	.000280	.....	.....	
2,144	95,000	.003990	.000350	.....	.....	
2,257	100,000	.004350	.000360	.000740	.000400	
2,370	105,000	.004740	.000390	.....	.....	
2,483	110,000	.005220	.000480	.....	.....	
2,596	115,000	.005780	.000560	.....	.....	
2,708	120,000	.006490	.000710	.001920	.001130	
2,821	125,000	.007540	.001050	.....	.....	
2,934	130,000	.009570	.002030	.....	.....	
3,036	134,510	.020000	.010430	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	134,510
Elongation per inch after rupture	inch	.012
Dimensions at point of rupture		″.125×″.125
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1″.3 outside the gauged length
Character of broken surface		fine silky

No. 1678.

Sectional area, ″.1500×″.1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000230	.000230	.....	.....	
339	15,000	.000370	.000140	.....	.....	
451	20,000	.000550	.000130	.000030	.000030	
564	25,000	.000740	.000190	.....	.....	
677	30,000	.000940	.000200	.....	.....	
790	35,000	.001130	.000190	.....	.....	
903	40,000	.001310	.000180	.000060	.000030	
1,016	45,000	.001500	.000190	.....	.....	
1,129	50,000	.001720	.000220	.....	.....	
1,241	55,000	.001930	.000210	.....	.....	
1,354	60,000	.002140	.000210	.000160	.000100	
1,467	65,000	.002350	.000210	.....	.....	
1,580	70,000	.002600	.000250	.....	.....	
1,693	75,000	.002870	.000270	.....	.....	
1,806	80,000	.003170	.000300	.000350	.000190	
1,918	85,000	.003430	.000260	.....	.....	
2,031	90,000	.003720	.000290	.....	.....	
2,144	95,000	.004070	.000350	.....	.....	
2,257	100,000	.004470	.000400	.000820	.000470	
2,370	105,000	.004970	.000500	.....	.....	
2,483	110,000	.005470	.000500	.....	.....	
2,596	115,000	.006230	.000760	.....	.....	
2,708	120,000	.007320	.001090	.002630	.001810	
2,821	125,000	.008960	.001640	.....	.....	
2,890	128,050	.017500	.008540	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	128,050
Elongation per inch after rupture	inch	.023
Dimensions at point of rupture		″.125×″.125
Reduction in area after rupture, per centum of original section		30.7
Character of broken surface		fine silky

No. 1679.

ctional area, ″.1500×″.1505 =.02257 square inch.

.pplied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
tal.	Per square inch.					
nds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000170	.000170	.....	.....	
339	15,000	.000340	.000170	.....	.....	
451	20,000	.000500	.000160	—.000020	—.000020	
564	25,000	.000660	.000160	.....	.....	
677	30,000	.000850	.000190	.....	.....	
790	35,000	.001040	.000190	.....	.....	
903	40,000	.001250	.000210	0.	.000020	
016	45,000	.001450	.000200	.....	.....	
129	50,000	.001650	.000200	.....	.....	
241	55,000	.001850	.000200	.....	.....	
354	60,000	.002070	.000220	.000120	.000120	
467	65,000	.002320	.000250	.....	.....	
580	70,000	.002540	.000220	.....	.....	
693	75,000	.002800	.000260	.....	.....	
806	80,000	.003070	.000270	.000310	.000190	
918	85,000	.003320	.000250	.....	.....	
031	90,000	.003620	.000300	.....	.....	
144	95,000	.003970	.000350	.....	.....	
257	100,000	.004310	.000340	.000730	.000420	
370	105,000	.004700	.000390	.....	.....	
483	110,000	.005140	.000440	.....	.....	
596	115,000	.005760	.000620	.....	.....	
708	120,000	.006560	.000800	.002010	.001280	
821	125,000	.007560	.001000	.....	.....	
934	130,000	.010220	.002660	.....	.....	
955	130,930	.014100	.003880	.....	.....	Tensile strength.

General summary.

trength per square inch of original section	pounds..	130,930
on per inch after rupture	inch..	.008
ons at point of rupture		″.118×″.118
n in area after rupture, per centum of original section		38.3
of rupture		2″.6 outside the gauged length
r of broken surface		fine silky

Samples of wire taken from experimental cast-iron wire-wound cylinder after completion the soldering process and dismantling of the cylinder.

No. 747.

Mark, 1.
Sectional area, ″.1495×″.1495=.02235 square inch.
Gauged length 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	Initial load.
224	10,000	.0018	.....	
335	15,000	.0033	.....	
447	20,000	.0051	.0001	
559	25,000	.0069	.....	
671	30,000	.0088	.....	
782	35,000	.0103	.....	
894	40,000	.0122	.0003	
1,006	45,000	.0138	.....	
1,118	50,000	.0152	.....	
1,229	55,000	.0178	.....	
1,341	60,000	.0193	.0004	
1,453	65,000	.0210	.....	
1,565	70,000	.0230	.....	
1,676	75,000	.0248	.....	
1,788	80,000	.0267	.0006	
1,900	85,000	.0287	.....	
2,012	90,000	.0304	.....	
2,123	95,000	.0326	.....	
2,235	100,000	.0346	.0008	
2,347	105,000	.0367	.....	
2,459	110,000	.0392	.....	
2,570	115,000	.0417	.....	
2,682	120,000	.0449	.0043	
2,794	125,000	.0480	.....	
2,906	130,000	.0504	.....	
3,017	135,000	.0532	.....	
3,129	140,000	.0567	.0094	
3,241	145,000	.0600	.....	
3,353	150,000	.0644	.....	
3,464	155,000	.0690	.....	
3,576	160,000	.0750	.0190	
3,688	165,000	.0813	.....	
3,800	170,000	.0878	.....	
4,046	181,029	.....	.....	Tensile strength.
0	0	.11	.....	

Fractured 2″.1 inside the gauged length.
Area at fracture, ″.133×″.133=.0177 square inch.
Contraction, 20.8 per cent.
Appearance, silky.

No. 748.

2.
nal area, ″.149×″.149=.0222 square inch.
d length, 10″.

ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
5,000	0.	0.	Initial load.
10,000	.0018	.....	
15,000	.0036	.....	
20,000	.0052	0.	
25,000	.0060	.....	
30,000	.0082	.....	
35,000	.0102	.....	
40,000	.0121	.0005	
45,000	.0142	.....	
50,000	.0160	.....	
55,000	.0178	.....	
60,000	.0193	.0009	
65,000	.0210	.....	
70,000	.0229	.....	
75,000	.0249	.....	
80,000	.0268	.0009	
85,000	.0285	.....	
90,000	.0305	.....	
95,000	.0326	.....	
100,000	.0346	.0022	
105,000	.0365	.....	
110,000	.0390	.....	
115,000	.0412	.....	
120,000	.0433	.0039	
125,000	.0459	.....	
130,000	.0484	.....	
135,000	.0507	.....	
140,000	.0536	.0063	
145,000	.0564	.....	
150,000	.0593	.....	
155,000	.0631	.....	
160,000	.0682	.0120	
165,000	.0712	.....	
170,000	.0763	.....	
185,774	.....	.....	Tensile strength.
0	.03	.....	

at fracture, ″.132×″.132=.0174 square inch.
action, 21.6 per cent.
ured 2″ outside the gauged length.
arance, silky; light-colored metal at the circumference.

No. 749.

Mark, 3.
Sectional area, ′.1495×″.1495=.02235 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	Initial load.
224	10,000	.0013	.....	
335	15,000	.0033	.....	
447	20,000	.0049	0.	
559	25,000	.0064	.....	
671	30,000	.0081	.....	
782	35,000	.0094	.....	
894	40,000	.0114	.0001	
1,006	45,000	.0131	.....	
1,118	50,000	.0149	.....	
1,229	55,000	.0166	.....	
1,341	60,000	.0182	.0002	
1,453	65,000	.0201	.....	
1,565	70,000	.0221	.....	
1,676	75,000	.0239	.....	
1,788	80,000	.0260	.0008	
1,900	85,000	.0279	.....	
2,012	90,000	.0299	.....	
2,123	95,000	.0319	.....	
2,235	100,000	.0340	.0022	
2,347	105,000	.0362	.....	
2,459	110,000	.0387	.....	
2,570	115,000	.0408	.....	
2,682	120,000	.0433	.0041	
2,794	125,000	.0460	.....	
2,906	130,000	.0486	.....	
3,017	135,000	.0508	.....	
3,129	140,000	.0550	.0089	
3,241	145,000	.0582	.....	
3,353	150,000	.0619	.....	
3,464	155,000	.0659	.....	
3,576	160,000	.0712	.0163	
3,688	165,000	.0769	.....	
3,800	170,000	.0860	.....	
4,056	181,923	.....	.....	Tensile strength.

Area at fracture, ″.135×″.135=.0182 square inch.
Contraction, 18.6 per cent.
Fractured 2½″ inside the gauged length.
Appearance, fine silky.

Sample of wire which broke while winding the experimental cast-iron cylinder.

ectional area, ″.149×″.149=.022 square inch.
ensile strength, 3,890 pounds=176,820 pounds per square inch.
rea at fracture, ″.148×″.148=.0219 square inch.
ontraction, 1.3 per cent.
actured 4″ from break in wire which occurred during winding.
earance, silky. Surface, conchoidal.

Tinned steel wire tested after treatment by heating and cooling.

o. 1. Tested as cut from coil.
o. 2. Heated and plunged into water.
o. 3. Stream of water on tongs and wire until cooled.
o. 4. Heated and tongs taken off, and wire cooled as soon as braz- would have set.
o. 5. Heated and allowed to cool in hot tongs.

ectional area of wire, ″.149×″.149=.0222 square inch.

Test number.	Mark.	Tensile strength.		Area at fracture.	Contraction of area.
		Total.	Per square inch.		
		Pounds.	*Pounds.*	*In. In. Sq. in.*	*Per cent.*
1147	1	3,815	171,850	.130×.130=.0169	23.9
1148	2	2,020	91,000	.100×.100=.0100	55.0
1149	2	1,980	89,190	.100×.100=.0100	56.0
1150	3	2,010	90,050	.100×.100=.0100	55.0
1151	3	1,930	86,940	.100×.100=.0100	55.0
1152	4	1,880	84,680	.100×.100=.0100	55.0
1153	4	1,915	86,260	.090×.090=.0081	63.5
1154	5	1,830	82,430	.095×.095=.0090	59.5
1155	5	1,920	86,480	.095×.095=.0090	59.5
1156	Spliced wires with teeth.	1,480	66,670	Separated along the splice.	
1157		1,590	71,620		
1158		900	40,540		
1159		1,540	69,370		

All the heated wires fractured near the end of the heated section; opposite end also drawing down at this point.

s of brazed splices with interlocking teeth of ″.15 steel wire which have been swaged after brazing.

No. 2297.

Marks, III.
Tensile strength, 1,480 pounds.
Separated along scarf of weld.

No. 2298.

Marks, IIII.
Tensile strength, 1,820 pounds.
Fractured at end of scarf.

No. 2299.

Marks, IIIII.
ensile strength, 1,910 pounds.
ractured in scarf following joint ½ inch.

Tabulation of tests of ".15 square steel wire specimens from twenty selected billets.

Test number.	Mark.	Tensile strength per square inch.	Elongation. At 140,000 pounds per square inch.	Elongation. After rupture.	Contraction of area.	Location of fracture.	Appearance of fracture.
		Pounds.	*Per ct.*	*Per ct.*	*Per ct.*		
2302	I	160,850	.8	.9	16.0	5½" outside the gauged length.	Fine silky.
2303	II	161,800	.9	.9	23.9	3".8 inside the gauged length.	Do.
2304	III	159,730	.8	.6	21.5	5".6 outside the gauged length.	Do.
2305	IV	166,370	.8	1.5	21.2	1¼" outside the gauged length.	Do.
2306	V	170,710	.8	1.3	10.8	5½" outside the gauged length.	Do.
2307	VI	157,190	1.0	1.4	27.5	6½" outside the gauged length.	Do.
2308	VII	153,150	.8	.4	2.1	3½" outside the gauged length. At defective spot in the corner of wire.	Fine silky for the sound metal.
2309	VIII	148,410	1.0	.6	28.8	4½" outside the gauged length.	Fine silky.
2310	IX	166,670	.8	2.6	17.0	2" from middle of gauged length.	Do.
2311	X	144,460	1.0	.5	27.4	7" outside the gauged length.	Do.
2312	XI	175,890	.7	.8	13.7	5" outside the gauged length.	Do.
2313	XII	163,990	.9	.8	20.9	5" outside the gauged length.	Do.
2314	XIII	167,130	.9	2.4	16.0	2" inside the gauged length.	Do.
2315	XIV	158,600	.9	.6	21.3	5½" outside the gauged length.	Do.
2316	XV	164,200	.8	1.0	19.4	6⅝" outside the gauged length.	Do.
2317	XVI	157,740	.9	.7	20.4	5½" outside the gauged length.	Do.
2318	XVII	144,530	.9	.3	2.4	4".8 outside the gauged length. At defective spot in wire.	Fine silky for the sound metal.
2319	XVIII	157,440	.9	.6	21.9	5" outside the gauged length.	Fine silky.
2320	XIX	166,6.0	.8	2.5	20.9	At middle of gauged length.	Do.
2321	XX	164,890	.8	.8	20.2	4" outside the gauged length.	Do.

ples of wire taken from experimental cast-iron wire-wound cylinder after completion of the soldering process and dismantling of the cylinder.

'est um-ber.	Mark.	Tensile strength per square inch.	Elongation.		Contraction of area.	Location of fracture.	Appearance of fracture.
			At 140,000 pounds per square inch.	After rupture.			
		Pounds.	*Per ct.*	*Per ct.*	*Per ct.*		
747	1	181,029	.6	1.1	20.8	2".1 inside the gauged length.	Silky.
748	2	185,774	.5	.3	21.6	2" outside the gauged length.	Silky, light colored metal at circumference.
749	3	181,923	.5	.....	18.6	2½" inside the gauged length.	Fine silky.
[Samples have received a light annealing after the fifth draught.]							
1675	.....	130,790	.....	2.3	35.1	.....	Fine silky.
1676	.....	130,840	.....	.4	40.4	Outside the gauged length.	Do.
1677	.....	134,510	.....	1.2	30.7	1".3 outside the gauged length.	Do.
1678	.....	128,050	.....	2.3	30.7	.....	Do.
1679	.....	130,930	.....	.8	38.3	2".6 outside the gauged length.	Do.

OUND STEEL WIRE.

[Foreign manufacture.]

No. 2300.

Straightened from a coil 8″ diameter before testing.
Diameter, ″.0880.
Sectional area, .00608 square inch.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30.4	5,000	0.	0.	0.	0.	Initial load.
60.8	10,000	.000240	.000240	.....	.....	
91.2	15,000	.000440	.000200	.....	.....	
121.6	20,000	.000590	.000150	.....	.....	
152.0	25,000	.000820	.000230	.....	.....	
182.4	30,000	.001010	.000190	.....	.....	
212.8	35,000	.001160	.000150	.....	.....	
243.2	40,000	.001340	.000180	.....	.....	
273.6	45,000	.001520	.000180	.....	.....	
304.0	50,000	.001740	.000220	.....	.....	
334.4	55,000	.001900	.000160	.....	.....	
364.8	60,000	.002110	.000210	.....	.....	
395.2	65,000	.002330	.000220	.....	.....	
425.6	70,000	.002520	.000190	.....	.....	
456.0	75,000	.002730	.000210	.....	.....	
486.4	80,000	.002920	.000190	.....	.....	
516.8	85,000	.003120	.000200	.....	.....	
547.2	90,000	.003330	.000210	.....	.....	
577.6	95,000	.003510	.000180	.....	.....	
608.0	100,000	.003720	.000210	.....	.....	
638.4	105,000	.003940	.000220	.....	.....	
668.8	110,000	.004180	.000240	.....	.....	
699.2	115,000	.004400	.000220	.....	.....	
729.6	120,000	.004700	.000300	.....	.....	
760.0	125,000	.004950	.000250	.....	.....	
790.4	130,000	.005200	.000250	.....	.....	
820.8	135,000	.005500	.000300	.....	.....	
851.2	140,000	.005790	.000290	.....	.....	
881.6	145,000	.006100	.000310	.....	.....	
912.0	150,000	.006350	.000250	.....	.....	
942.4	155,000	.006690	.000340	.....	.....	
972.8	160,000	.007030	.000340	.....	.....	
1,003.2	165,000	.007380	.000350	.....	.....	
1,033.6	170,000	.007740	.000360	.....	.....	
1,064.0	175,000	.008160	.000420	.....	.....	
1,094.4	180,000	.008570	.000410	.....	.....	
1,124.8	185,000	.009070	.000500	.....	.....	
1,155.2	190,000	.009520	.000450	.....	.....	
1,185.6	195,000	.010090	.000570	.....	.....	
1,216.0	200,000	.010750	.000660	.....	.....	
1,246.4	205,000	.011630	.000880	.....	.....	
1,276.8	210,000	.012470	.000840	.....	.....	
1,478.0	243,090	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	243,090
Elongation per inch after rupture	inch..	.025
Reduction in diameter at point of rupture	do...	.024
Reduction in area after rupture, per centum of original section		47.1
Position of rupture		at middle of length
Character of broken surface		fine silky

No. 2301.

same coil as No. 2300, annealed by heating cherry red in a gas
cooling in open air.
ɜter, ″.0880.
nal area, .00608 square inch.

ied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.000230	.000230	.....	.....	
15,000	.000410	.000180	.....	.....	
20,000	.000590	.000180	.....	.....	
25,000	.000760	.000170	.....	.....	
30,000	.000920	.000160	.....	.....	
35,000	.001120	.000200	.....	.....	
40,000	.001280	.000160	.....	.....	
45,000	.001480	.000200	.....	.....	
50,000	.001650	.000170	.....	.....	
55,000	.001860	.000210	.....	.....	
60,000	.002030	.000170	.....	.....	
65,000	.002250	.000220	.....	.....	
70,000	.002460	.000210	.....	.....	
75,000	.002750	.000290	.....	.....	
80,000	.003120	.000370	.....	.....	
85,000	.003550	.000430	.....	.....	
90,000	.004870	.001320	.....	.....	
95,000	.008550	.003680	.....	.....	
121,050	.....	.....	.....	.....	Tensile strength.

General summary.

ngth per square inch of original section	pounds..	121,050
per inch after rupture	inch..	.038
n diameter at point of rupture	do...	.035
n area after rupture, per centum of original section		63.7
rupture	8″ outside the ganged length	
f broken surface	fine silky	

EXPERIMENTAL CAST-IRON WIRE-WOUND CYLINDER.

This experiment consisted in winding a cast-iron cylinder with thirt seven layers of steel wire ".15 square, laying two wires at a time, ea under a tension of 900 pounds total, or 40,000 pounds per square inc

Previous to winding the cylinder was measured; its external and i ternal diameters and length, and also diameters on each flat face, we established by center punch marks and their distance apart measure

The dimensions were all referred to standard bars of wrought ir kept in the same room with the cylinder.

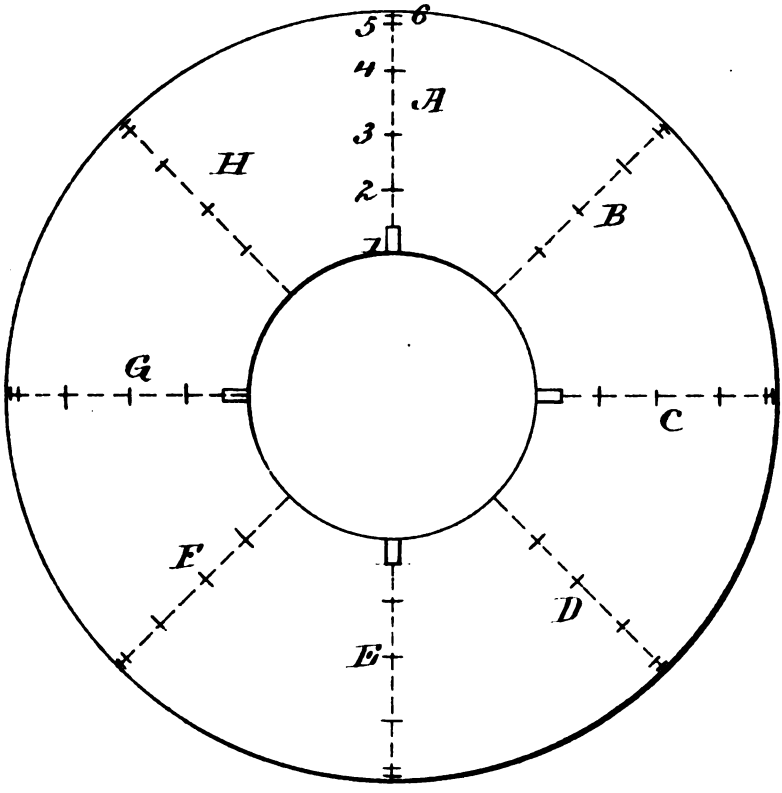
During the progress of winding the accessible diameters of the bo were measured from time to time.

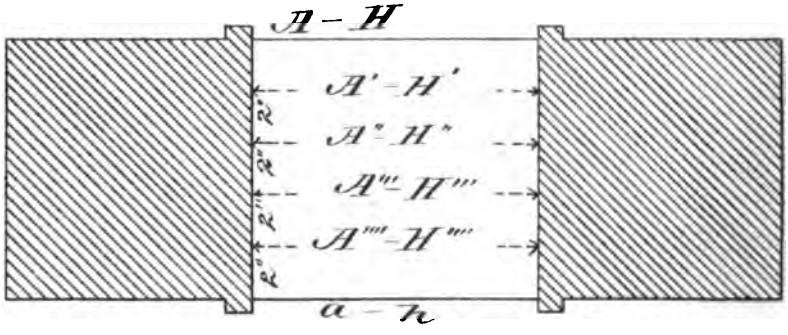
When the winding was completed and the cylinder removed from tl lathe, a complete set of measurements was taken, excepting the extern diameters, which were covered with wire wrapping.

These measurements were again repeated after the process of solde ing and after dismantling.

The diameters of the bore at face *a h* were repeatedly measured befoı winding began, it having been found that the apparent diameters varie on different occasions when compared with the wrought-iron standar bar. The difference in diameters then observed was attributed to th difference between the mean temperature of the standard bar and th cylinder, and while the standard bar had the temperature of the sur face of the cylinder, the interior metal did not immediately follow th changes in temperature of the testing-room.

Experimental wire-wound cylinder
Cast iron.





H Ex 31 49 2

s showing variations in diameters of bore of cylinder at different temperatures.

te of measurements.	Temperature of testing-room.	Lines of measurements.			
		a	*b*	*c*	*d*
	Degrees.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
t 18		11.0004	10.9996	10.9994	11.0004
VARIATIONS.					
t 19, a. m	78	—.0002	—.0003	—.0004	—.0002
t 19, p. m	85	—.0001	—.0003	—.0003	—.0001
t 20, a. m	76	—.0004	—.0006	—.0008	—.0005
t 20, p. m	80	—.0002	—.0003	—.0004	—.0002
t 21, a. m	75	—.0003	—.0003	—.0005	—.0003
t 21, p. m	78	0.	—.0001	—.0003	0.
t 22, a. m	82–79	0.	—.0001	—.0003	0.
t 22, p. m	86	.0002	.0001	—.0001	—.0002
t 24, a. m	84–80	—.0004	—.0006	—.0008	—.0004
t 24, p. m	86	0.	—.0002	—.0003	0.
t 25, a. m	84–80	—.0003	—.0004	—.0006	—.0003
t 25, p. m	75	—.0001	—.0002	—.0004	—.0001
t 26, a. m	76–71	—.0002	—.0004	—.0006	—.0002
t 26, p. m	72	—.0002	—.0004	—.0006	—.0002
t 27, a. m	70	—.0003	—.0004	—.0007	—.0003
t 27, p. m	77	—.0001	—.0002	—.0004	—.0001

Diameters of bore of cylinder.

	Line of measurements.				Means.
	A	B	C	D	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
l	11.0016	11.0006	11.0006	11.0014	11.00105
7 layers of wire	10.9855	10.9843	10.9845	10.9849	10.98480
mpression	.0161	.0163	.0161	.0165	.01625
oldering	10.9884	10.9877	10.9878	10.9882	10.988025
ry due to soldering	.0029	.0034	.0033	.0033	.003225
lismantling	10.9989	10.9981	10.9978	10.9986	10.99835
ry between soldering and antling	.0105	.0104	.0100	.0104	.010325
nent set	.0027	.0025	.0028	.0028	.0027

	Line of measurements.				Means.
	A′	B′	C′	D′	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
al	11.0015	11.0006	11.0004	11.0015	11.0010
7 layers of wire	10.9851	10.9842	10.9840	10.9850	10.984575
Compression	.0164	.0164	.0164	.0165	.016425
oldering	10.9881	10.9877	10.9873	10.9882	10.987825
ry due to soldering	.0030	.0035	.0033	.0032	.003250
lismantling	10.9988	10.9980	10.9975	10.9987	10.998250
ry between soldering and antling	.0107	.0103	.0102	.0105	.010425
nent set	.0027	.0026	.0029	.0028	.002750

Tables showing variations in diameters of bore of cylinder at different temperatures—

	Line of measurements.				M
	A″	B″	C″	D″	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*I*
Original	11.0000	10.9991	10.9991	10.9999	10.
After 37 layers of wire	10.9833	10.9827	10.9828	10.9832	10.
Compression	.0167	.0164	.0163	.0167	.
After soldering	10.9865	10.9858	10.9859	10.9863	10.
Recovery due to soldering	.0031	.0031	.0031	.0031	.
After dismantling	10.9866	10.9866	10.9863	10.9870	10.
Recovery between soldering and dismantling	.0111	.0110	.0104	.0107	.
Permanent set	.0024	.0025	.0028	.0029	.

	Line of measurements.				M
	A‴	B‴	C‴	D‴	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*I*
Original	11.0001	10.9995	10.9994	11.0000	10.
After 37 layers of wire	10.9833	10.9828	10.9826	10.9832	10.
Compression	.0166	.0167	.0168	.0168	.
After soldering	10.9864	10.9859	10.9857	10.9863	10.
Recovery due to soldering	.0031	.0031	.0031	.0031	.
After dismantling	10.9874	10.9867	10.9866	10.9872	10.
Recovery between soldering and dismantling	.0110	.0108	.0109	.0109	.
Permanent set	.0007	.0008	.0008	.0008	.

	Line of measurements.				M
	A⁗	B⁗	C⁗	D⁗	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*I*
Original	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
After 37 layers of wire	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Compression	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
After soldering	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Recovery due to soldering	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
After dismantling	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Recovery between soldering and dismantling	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Permanent set	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	Line of measurements.				M
	a	*b*	*c*	*d*	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*I*
Original	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
After 37 layers of wire	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Compression	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
After soldering	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Recovery due to soldering	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
After dismantling	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Recovery between soldering and dismantling	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Permanent set	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Diameters of bore of cylinder, taken while in the lathe during the progress of wire-winding.

	Line of measurements.			
	B	D	b	d
	Inches.	*Inches.*	*Inches.*	*Inches.*
Original	11.0006	11.0014	10.9996	11.0004
After 7 layers of wire	10.9974	10.9981	10.9967	10.9972
Compression	.0032	.0033	.0029	.0032
After 18 layers of wire	10.9920	10.9925	10.9910	10.9917
Compression	.0086	.0089	.0086	.0087
After 29 layers of wire	10.9873	10.9879	10.9860	10.9866
Compression	.0133	.0135	.0136	.0138
After 37 layers of wire	10.9843	10.9849	10.9831	10.9838
Compression	.0163	.0164	.0165	.0166

Exterior diameters of cylinders.

	Line of measurements.				Means.
	A	B	C	D	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6926	29.6942	29.6945	29.6938	29.693775
After winding and dismantling	29.6908	29.6922	29.6922	29.6915	29.691675
Permanent set	.0018	.0020	.0023	.0023	.002100

	Line of measurements.				Means.
	A′	B′	C′	D′	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6931	29.6936	29.6932	29.6955	29.693850
After winding and dismantling	29.6922	29.6926	29.6920	29.6921	29.692225
Permanent set	.0009	.0010	.0012	.0034	.001625

	Line of measurements.				Means.
	A″	B″	C″	D″	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6925	29.6927	29.6927	29.6942	29.693025
After winding and dismantling	29.6905	29.6909	29.6908	29.6903	29.690625
Permanent set	.0020	.0018	.0019	.0039	.002400

	Line of measurements.				Means.
	A‴	B‴	C‴	D‴	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6926	29.6929	29.6927	29.6959	29.693525
After winding and dismantling	29.6897	29.6899	29.6897	29.6902	29.689900
Permanent set	.0029	.0030	.0030	.0057	.003625

Exterior diameters of cylinders—Continued.

	Line of measurements.				Means.
	A''''	B''''	C''''	D''''	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6914	29.6920	29.6911	29.6951	29.692400
After winding and dismantling	29.6891	29.6894	29.6889	29.6895	29.689225
Permanent set	.0023	.0026	.0022	.0056	.003175

	Line of measurements.				Means.
	a	*b*	*c*	*d*	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6921	29.6936	29.6872	29.6934	29.691575
After winding and dismantling	29.6896	29.6915	29.6861	29.6918	29.689750
Permanent set	.0025	.0021	.0011	.0016	.001825

Surface diameters of cylinder on face A–H.

	Line of measurements.				Means.
	A_2	B_2	C_2	D_2	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	15.6695	15.6805	15.6745	15.6734	15.674475
After 37 layers of wire	15.6539	15.6648	15.6585	15.6575	15.658675
Compression	.0156	.0157	.0160	.0159	.015800
After soldering	15.6566	15.6685	15.6623	15.6616	15.662250
Recovery due to soldering	.0027	.0037	.0038	.0041	.003575
After dismantling	15.6657	15.6779	15.6719	15.6716	15.671775
Recovery between soldering and dismantling	.0091	.0094	.0096	.0100	.009525
Permanent set	.0038	.0026	.0026	.0018	.002700

	Line of measurements.				Means.
	A_3	B_3	C_3	D_3	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	20.3415	20.3464	20.3486	20.3460	20.345625
After 37 layers of wire	20.3256	20.3309	20.3329	20.3304	20.329950
Compression	.0159	.0155	.0157	.0156	.015675
After soldering	20.3284	20.3338	20.3350	20.3325	20.332425
Recovery due to soldering	.0028	.0029	.0021	.0021	.002475
After dismantling	20.3384	20.3445	20.3456	20.3435	20.34300
Recovery between soldering and dismantling	.0100	.0107	.0106	.0110	.010575
Permanent set	.0031	.0019	.0030	.0025	.002625

Surface diameters of cylinder on face A–H—Continued.

	Line of measurements.				Means.
	A_4	B_4	C_4	D_4	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
.....	25.0307	25.0219	25.0302	25.0262	25.027250
s of wire.....	25.0139	25.0049	25.0133	25.0091	25.010300
sion	.0168	.0170	.0169	.0171	.016950
g	25.0170	25.0085	25.0166	25.0130	25.013775
to soldering.....	.0031	.0036	.0033	.0039	.003475
ling.....	25.0277	25.0191	25.0274	25.0237	25.024475
reen soldering and					
.....	.0107	.0106	.0108	.0107	.010700
.....	.0030	.0028	.0028	.0025	.002775

	Line of measurements.				Means.
	A_5	B_5	C_5	D_5	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
.....	28.7960	28.7806	28.8032	28.7864	28.791550
s of wire.....	28.7775	28.7630	28.7856	28.7692	28.773825
sion	.0185	.0176	.0176	.0172	.017725
g	28.7826	28.7667	28.7892	28.7752	28.778425
to soldering.....	.0051	.0037	.0036	.0060	.004600
ling	28.7937	28.7786	28.8012	28.7849	28.789600
reen soldering and					
.....	.0111	.0119	.0120	.0097	.011175
.....	.0023	.0020	.0020	.0015	.001950

	Line of measurements.				Means.
	A_6	B_6	C_6	D_6	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
.....	29.3992	29.4072	29.3960	29.3976	29.400000
s of wire.....	29.3741	29.3672	29.3777	29.3797	29.374675
sion	.0251	.0400	.0183	.0179	.025325
g	29.3781	29.3707	29.3809	29.3833	29.378250
to soldering	.0040	.0035	.0032	.0036	.003575
ling.....	29.3891	29.3821	29.3925	29.3949	29.389650
reen soldering and					
.....	.0110	.0114	.0116	.0116	.011400
.....	.0101	.0251	.0035	.0027	.010350

Surface diameters of cylinder on face a–h.

	Line of measurements.				Means.
	a_2	b_2	c_2	d_2	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
.....	15.6707	15.6731	15.6739	15.6766	15.673575
s of wire.....	15.6555	15.6589	15.6583	15.6599	15.658150
on	.0152	.0142	.0156	.0167	.015425
g	15.6589	15.6614	15.6619	15.6641	15.661575
to soldering	.0034	.0025	.0036	.0042	.003425
ling.....	15.6690	15.6718	15.6723	15.6740	15.671775
reen soldering and					
.....	.0101	.0104	.0104	.0099	.010200
.....	.0017	.0013	.0016	.0026	.001800

Surface diameters of cylinder on face a–h—Continued.

	Line of measurements.				M
	a_3	b_3	c_3	d_3	a_3
	Inches.	*Inches.*	*Inches.*	*Inches.*	I
Original	20.3481	20.3468	20.3371	.....	20.
After 37 layers of wire	20.3304	20.3299	20.3202	.....	20.
Compression	.0177	.0169	.0169	.....	.
After soldering	20.3338	20.3333	20.3236	20.3290	20.
Recovery due to soldering	.0034	.0034	.0034	.....	.
After dismantling	20.3454	20.3447	20.3342	20.3396	20.
Recovery between soldering and dismantling	.0116	.0114	.0106	.0106	.
Permanent set	.0027	.0021	.0019	.....	.

	Line of measurements.				M
	a_4	b_4	c_4	d_4	
	Inches.	*Inches.*	*Inches.*	*Inches.*	I
Original	25.0257	25.0169	25.0204	25.0142	25.
After 37 layers of wire	25.0066	24.9985	25.0025	24.9967	25.
Compression	.0191	.0184	.0179	.0175	.
After soldering	25.0109	25.0020	25.0062	24.9992	25.
Recovery due to soldering	.0043	.0035	.0037	.0025	.
After dismantling	25.0225	25.0136	25.0185	25.0112	25.
Recovery between soldering and dismantling	.0116	.0116	.0123	.0120	.
Permanent set	.0032	.0033	.0019	.0030	.

	Line of measurements.				M
	a_5	b_5	c_5	d_5	
	Inches.	*Inches.*	*Inches.*	*Inches.*	I
Original	28.8006	28.7991	28.7981	28.7983	28.
After 37 layers of wire	28.7805	28.7805	28.7794	28.7746	28.
Compression	.0201	.0186	.0187	.0237	.
After soldering	28.7857	28.7850	28.7839	28.7786	28.
Recovery due to soldering	.0052	.0045	.0045	.0040	.
After dismantling	28.7977	28.7970	28.7957	28.7908	28.
Recovery between soldering and dismantling	.0120	.0120	.0118	.0122	.
Permanent set	.0029	.0021	.0024	.0075	.

	Line of measurements.				M
	a_6	b_6	C_6	D_6	
	Inches.	*Inches.*	*Inches.*	*Inches.*	I
Original	29.3978	29.3967	29.3951	29.3948	29.
After 37 layers of wire	29.3748	29.3776	29.3763	29.3765	29.
Compression	.0230	.0191	.0188	.0183	.
After soldering	29.3828	29.3821	29.3800	29.3803	29.
Recovery due to soldering	.0080	.0045	.0037	.0038	.
After dismantling	29.3948	29.3947	29.3925	29.3927	29.
Recovery between soldering and dismantling	.0120	.0126	.0125	.0124	.
Permanent set	.0030	.0020	.0026	.0021	.

Measurements of length of cylinder before and after winding.

LENGTH NO. 1.

Lines of measurements.	Original.	After winding.	Elongation.	Mean elongation.
	Inches.	*Inches.*	*Inch.*	*Inch.*
A_1	10.0018	10.0069	.0051	.0042625
B_1	10.0008	10.0049	.0041	
C_1	10.0023	10.0072	.0049	
D_1	10.0008	10.0051	.0043	
E_1	10.0018	10.0059	.0041	
F_1	10.000	10.0040	.0040	
G_1	9.9998	10.0039	.0041	
H_1	10.0003	10.0038	.0035	

LENGTH NO. 2.

A_2	10.0020	10.0062	.0042	.004225
B_2	10.0024	10.0068	.0044	
C_2	10.0003	10.0054	.0051	
D_2	10.0020	10.0063	.0043	
E_2	10.0020	10.0064	.0044	
F_2	10.0000	10.0039	.0039	
G_2	10.0006	10.0045	.0039	
H_2	10.0018	10.0054	.0036	

LENGTH NO. 3.

A_3	10.0008	10.0038	.0030	.003225
B_3	10.0009	10.0046	.0037	
C_3	9.9995	10.0030	.0035	
D_3	10.0001	10.0034	.0033	
E_3	10.0001	10.0033	.0032	
F_3	9.9980	10.0011	.0031	
G_3	9.9983	10.0012	.0029	
H_3	10.0001	10.0032	.0031	

LENGTH NO. 4.

A_4	10.0006	10.0029	.0023	.002125
B_4	10.0008	10.0027	.0019	
C_4	9.9995	10.0017	.0022	
D_4	10.0002	10.0020	.0018	
E_4	9.9997	10.0016	.0019	
F_4	9.9975	9.9987	.0012	
G_4	9.9975	9.9997	.0022	
H_4	9.9997	10.0032	.0035	

LENGTH NO. 5.

A_5	10.0005	10.0021	.0016	.0012625
B_5	10.0007	10.0019	.0012	
C_5	9.9987	9.9995	.0008	
D_5	9.9997	10.0007	.0010	
E_5	9.9994	10.0005	.0011	
F_5	9.9965	9.9972	.0007	
G_5	9.9968	9.9980	.0012	
H_5	9.9989	10.0014	.0025	

LENGTH NO. 6.

A_6	10.0004	10.0021	.0017	.001325
B_6	10.0007	10.0019	.0012	
C_6	9.9985	9.9995	.0010	
D_6	9.9995	10.0007	.0012	
E_6	9.9992	10.0005	.0013	
F_6	9.9960	9.9967	.0007	
G_6	9.9970	9.9980	.0010	
H_6	9.9989	10.0014	.0025	

Cast-iron specimens from cylinder after dismantling.

No. 2600, No. 2601, No. 672, No. 673 } Tangential specimens, next bore.

No. 674, No. 675 } Radial specimens, next bore.

No. 2600.

Mark, 1.
Diameter, ″.798.
Sectional area, .50 square inch.
Length, 6″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000050	.000050	.....	.....	
1,500	3,000	.000100	.000050	.....	.....	
2,000	4,000	.000167	.000067	.....	.....	
2,500	5,000	.000233	.000066	0.	.....	
3,000	6,000	.000300	.000067	.....	.....	
3,500	7,000	.000367	.000067	.....	.....	
4,000	8,000	.000450	.000083	.....	.....	
4,500	9,000	.000533	.000083	.....	.....	
5,000	10,000	.000600	.000067	.000100	.000100	
5,500	11,000	.000700	.000100	.....	.....	
6,000	12,000	.000783	.000083	.....	.....	
6,500	13,000	.000867	.000084	.....	.....	
7,000	14,000	.000950	.000083	.....	.....	
7,500	15,000	.001033	.000083	.000200	.000100	
8,000	16,000	.001150	.000117	.....	.....	
8,500	17,000	.001267	.000117	.....	.....	
9,000	18,000	.001350	.000083	.....	.....	
9,500	19,000	.001467	.000117	.....	.....	
10,000	20,000	.001633	.000166	.000433	.000233	
10,500	21,000	.001783	.000150	.....	.....	
11,000	22,000	.001967	.000184	.....	.....	
11,500	23,000	.002183	.000216	.....	.....	
12,000	24,000	.002450	.000267	.....	.....	
12,500	25,000	.002833	.000383	.001150	.000717	
13,980	27,960	.....	.....	.....	.....	Tensile strength.

Fractured 1″ from middle of stem.
Character of broken surface, granular, mottled.

No. 2601.

3.
ter, ″.798.
nal area, .50 square inch.
h, 6″.

ed loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
2,000	.000050	.000050	.....	.....	
3,000	.000100	.000050	.....	.....	
4,000	.000167	.000067	.....	.....	
5,000	.000233	.000066	0.	.....	
6,000	.000300	.000067	.....	.....	
7,000	.000350	.000050	.....	.....	
8,000	.000417	.000067	.....	.....	
9,000	.000483	.000066	.....	.....	
10,000	.000567	.000084	.000067	.000067	
11,000	.000633	.000066	.....	.....	
12,000	.000717	.000084	.....	.....	
13,000	.000817	.000100	.....	.....	
14,000	.000883	.000066	.....	.....	
15,000	.001000	.000117	.000183	.000116	
16,000	.001067	.000067	.....	.....	
17,000	.001150	.000083	.....	.....	
18,000	.001267	.000117	.....	.....	
19,000	.001383	.000116	.....	.....	
20,000	.001550	.000167	.000383	.000200	
21,000	.001650	.000100	.....	.....	
22,000	.001800	.000150	.....	.....	
23,000	.001983	.000183	.....	.....	
24,000	.002183	.000200	.....	.....	
25,000	.002500	.000317	.000900	.000517	
28,400	.....	.....	.....	.....	Tensile strength.

red ⅜″ from middle of stem.
ter of broken surface, granular, mottled.

No. 672.

Mark, 2.
Length, 9″.05.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000050	.000050	.....	.....	
1,500	3,000	.000100	.000050	.....	.....	
2,000	4,000	.000150	.000050	.....	.....	
2,500	5,000	.000200	.000050	.000017	.000017	
3,000	6,000	.000283	.000083	.....	.....	
3,500	7,000	.000333	.000050	.....	.....	
4,000	8,000	.000400	.000067	.....	.....	
4,500	9,000	.000467	.000067	.....	.....	
5,000	10,000	.000517	.000050	.000050	.000033	
5,500	11,000	.000567	.000050	.....	.....	
6,000	12,000	.000633	.000066	.....	.....	
6,500	13,000	.000683	.000050	.....	.....	
7,000	14,000	.000750	.000067	.....	.....	
7,500	15,000	.000817	.000067	.000067	.000017	
8,000	16,000	.000867	.000050	.....	.....	
8,500	17,000	.000933	.000066	.....	.....	
9,000	18,000	.001000	.000067	.....	.....	
9,500	19,000	.001067	.000067	.....	.....	
10,000	20,000	.001133	.000066	.000100	.000033	
10,500	21,000	.001200	.000067	.....	.....	
11,000	22,000	.001250	.000050	.....	.....	
11,500	23,000	.001333	.000083	.....	.....	
12,000	24,000	.001383	.000050	.....	.....	
12,500	25,000	.001450	.000067	.000150	.000050	
13,000	26,000	.001517	.000067	.....	.....	
13,500	27,000	.001583	.000066	.....	.....	
14,000	28,000	.001683	.000100	.....	.....	
14,500	29,000	.001750	.000067	.....	.....	
15,000	30,000	.001867	.000117	.000283	.000033	
15,500	31,000	.002000	.000133	.....	.....	
16,000	32,000	.002083	.000083	.....	.....	
16,500	33,000	.002167	.000084	.....	.....	
17,000	34,000	.002233	.000066	.....	.....	
17,500	35,000	.002583	.000350	.001033	.000750	
18,000	36,000	.002817	.000234	.....	.....	
18,500	37,000	.003100	.000283	.....	.....	
19,000	38,000	.003367	.000267	.....	.....	
19,500	39,000	.009500	.006133	.....	.....	
25,490	50,980	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 673.

4.
h, 8″.97.
ster, ″.798.
nal area, .50 square inch.

ed loads. Per square inch.	Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	0.	0.	0.	0.	Initial load.
2,000	.000050	.000050	.....	.....	
3,000	.000083	.000033	.....	.....	
4,000	.000133	.000050	.....	.....	
5,000	.000183	.000050	0.	.....	
6,000	.000250	.000067	.....	.....	
7,000	.000300	.000050	.....	.....	
8,000	.000350	.000050	.....	.....	
9,000	.000417	.000067	.....	.....	
10,000	.000467	.000050	.000017	.000017	
11,000	.000533	.000066	.....	.....	
12,000	.000583	.000050	.....	.....	
13,000	.000650	.000067	.....	.....	
14,000	.000700	.000050	.....	.....	
15,000	.000767	.000067	.000033	.000016	
16,000	.000833	.000066	.....	.....	
17,000	.000883	.000050	.....	.....	
18,000	.000933	.000050	.....	.....	
19,000	.001000	.000067	.....	.....	
20,000	.001067	.000067	.000067	.0.0034	
21,000	.001117	.000050	.....	.....	
22,000	.001183	.000066	.....	.....	
23,000	.001250	.000067	.....	.....	
24,000	.001333	.000083	.....	.....	
25,000	.001383	.000050	.000083	.000016	
26,000	.001433	.000050	.....	.....	
27,000	.001500	.000067	.....	.....	
28,000	.001583	.000083	.....	.....	
29,000	.001650	.000067	.....	.....	
30,000	.001750	.000100	.000167	.000084	
31,000	.001833	.000083	.....	.....	
32,000	.001917	.000084	.....	.....	
33,000	.002067	.000150	.....	.....	
34,000	.002200	.000133	.....	.....	
35,000	.002367	.000167	.000483	.000316	
36,000	.002533	.000166	.....	.....	
37,000	.002750	.000217	.....	.....	
38,000	.003000	.000250	.....	.....	
39,000	.003250	.000250	.....	.....	
40,000	.003633	.000383	.001417	.000934	
52,560	.....	.....	.....	.....	Ultimate strength.

r of failure, triple flexure.

No. 674.

Mark, 8.
Length, 9″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remar
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000033	.000033	.....	.....	
1,500	3,000	.000067	.000034	.....	.....	
2,000	4,000	.000100	.000033	.....	.....	
2,500	5,000	.000150	.000050	0.	.....	
3,000	6,000	.000183	.000033	.....	.....	
3,500	7,000	.000250	.000067	.....	.....	
4,000	8,000	.000300	.000050	.....	.....	
4,500	9,000	.000350	.000050	.....	.....	
5,000	10,000	.000417	.000067	0.	.....	
5,500	11,000	.000483	.000066	.....	.....	
6,000	12,000	.000533	.000050	.....	.....	
6,500	13,000	.000583	.000050	.....	.....	
7,000	14,000	.000633	.000050	.....	.....	
7,500	15,000	.000683	.000050	.000033	.000033	
8,000	16,000	.000733	.000050	.....	.....	
8,500	17,000	.000783	.000050	.....	.....	
9,000	18,000	.000850	.000067	.....	.....	
9,500	19,000	.000917	.000067	.....	.....	
10,000	20,000	.000967	.000050	.000067	000034	
10,500	21,000	.001017	.000050	.....	.....	
11,000	22,000	.001083	.000066	.....	.....	
11,500	23,000	.001167	.000084	.....	.....	
12,000	24,000	.001200	.000033	.....	.....	
12,500	25,000	.001283	.000083	.0001 0	.00 0033	
13,000	26,000	.001350	.000067	.....	.....	
13,500	27,000	.001417	.000067	.....	.....	
14,000	28,000	.001500	.000083	.....	.....	
14,500	29,000	.001583	.000083	.....	.....	
15,000	30,000	.001667	.000084	.000217	.000117	
15,500	31,000	.001767	.000100	.....	.....	
16,000	32,000	.001850	.000083	.....	.....	
16,500	33,000	.0 2000	.000150	.....	.....	
17,000	34,000	.002100	.000100	.....	.....	
17,500	35,000	.002267	.000167	.000550	.000333	
18,000	36,000	.002417	.000150	.....	.....	
18,500	37,000	.002617	.000200	.....	.....	
19,000	38,000	.002833	.000216	.....	.....	
19,500	39,000	.003033	.000200	.....	.....	
20,000	40,000	.003333	.000300	.001350	.000800	
25,560	51,120	.....	.....	.....	.....	Ultimate stre

Manner of failure, triple flexure.

No. 675.

Mark, 9.
Length, 9″.01.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000067	.000067	.....	.....	
1,500	3,000	.000117	.000050	.....	.....	
2,000	4,000	.000167	.000050	.....	.....	
2,500	5,000	.000217	.000050	.000033	.000033	
3,000	6,000	.000283	.000066	.....	.....	
3,500	7,000	.000317	.000034	.....	.....	
4,000	8,000	.000367	.000050	.....	.....	
4,500	9,000	.000433	.000066	.....	.....	
5,000	10,000	.000483	.000050	.000100	.000067	
5,500	11,000	.000550	.000067	.....	.....	
6,000	12,000	.000600	.000050	.....	.....	
6,500	13,000	.000650	.000050	.....	.....	
7,000	14,000	.000717	.000067	.....	.....	
7,500	15,000	.000767	.000050	.000117	.000017	
8,000	16,000	.000833	.000066	.....	.....	
8,500	17,000	.000900	.000067	.....	.....	
9,000	18,000	.000967	.000067	.....	.....	
9,500	19,000	.001017	.000050	.....	.....	
10,000	20,000	.001067	.000050	.000167	.000050	
10,500	21,000	.001133	.000066	.....	.....	
11,000	22,000	.001217	.000084	.....	.....	
11,500	23,000	.001283	.000066	.....	.....	
12,000	24,000	.001333	.000050	.....	.....	
12,500	25,000	.001417	.000084	.000217	.000050	
13,000	26,000	.001500	.000083	.....	.....	
13,500	27,000	.001583	.000083	.....	.....	
14,000	28,000	.001667	.000084	.....	.....	
14,500	29,000	.001750	.000083	.....	.....	
15,000	30,000	.001900	.000150	.000417	.000200	
15,500	31,000	.002000	.000100	.....	.....	
16,000	32,000	.002100	.000100	.....	.....	
16,500	33,000	.002250	.000150	.....	.....	
17,000	34,000	.002417	.000167	.....	.....	
17,500	35,000	.002600	.000183	.000833	.000416	
18,000	36,000	.002833	.000233	.....	.....	
18,500	37,000	.003033	.000200	.....	.....	
19,000	38,000	.003433	.000400	.....	.....	
19,500	39,000	.003733	.000300	.....	.....	
20,000	40,000	.004067	.000334	.002000	.001167	
25,820	51,640	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

MEASUREMENTS OF A CAST-IRON INITIAL TENSION RING.

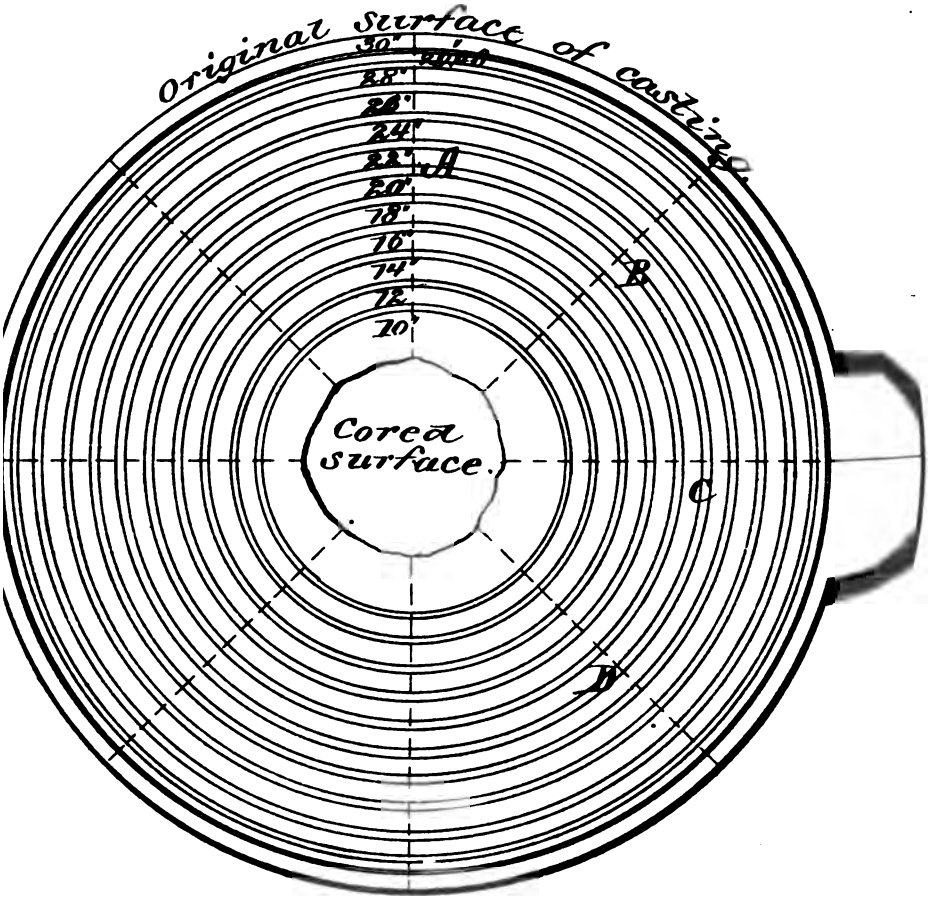
Table 1 shows measurements of diameters laid off on surface of ring before cutting up.

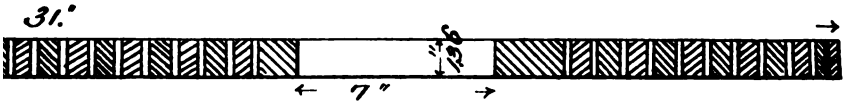
Table 2 shows diameters after removing an external and an internal ring, reducing the diameters of the initial tension ring to 29″.68 and 11″.4, respectively.

Table 3 shows diameters measured on the detached rings after having been detached by circular grooves midway the measured diameters.

Initial tension ring.

Cast iron.





H Ex 31 492

TABLE 1.—*Original dimensions of ring as cut from sinking head.*

Ring.	Diameters.				Mean.
	A	B	C	D	
Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
30	29.9952	29.9901	29.9974	29.9975	29.99505
28	28.0090	27.9997	28.0078	28.0022	28.00168
26	26.0082	26.0034	26.0040	26.0059	26.00538
24	24.0035	24.0075	24.0018	24.0105	24.00583
22	22.0045	22.0053	22.0078	22.0065	22.00593
20	20.0028	20.0008	20.0064	20.0013	20.00283
18	18.0130	18.0155	18.0172	18.0147	18.01510
16	16.0112	16.0128	16.0127	16.0144	16.01278
14	14.0155	14.0103	14.0133	14.0095	14.01215
12	12.0096	12.0156	12.0146	12.0121	12.01298
10	10.0266	10.0255	10.0240	10.0229	10.02475

TABLE 2.—*Dimensions after finishing to radial dimensions of trial cylinder.*

30*	30.0166	30.0496	30.0189	29.9719	30.01425
29.46	29.4647	29.4635	29.4686	29.4632	29.46500
28	28.0080	27.9981	28.0065	28.0011	28.00343
26	26.0066	26.0014	26.0026	26.0049	26.00388
24	24.0020	24.0066	24.0010	24.0095	24.00488
22	22.0033	22.0036	22.0066	22.0047	22.00455
20	20.0019	19.9997	20.0057	20.0006	20.00198
18	18.0118	18.0139	18.0152	18.0130	18.01348
16	16.0099	16.0110	16.0102	16.0125	16.01090
14	14.0137	14.0088	14.0113	14.0079	14.01042
12	12.0084	12.0145	12.0128	12.0109	12.01165
10*	10.0291	10.0285	10.0294	10.0262	10.02830

* Detached rings.

TABLE 3.—*Dimensions of rings after being detached.*

30	30.0166	30.0496	30.0189	29.9719	30.01425
29.46	29.4630	29.4665	29.4709	29.4618	29.46555
28	28.0064	27.9954	28.0050	28.0000	28.00170
26	26.0050	25.9985	25.9996	26.0020	26.00128
24	24.0004	24.0036	23.9983	24.0074	24.00243
22	22.0021	22.0019	22.0045	22.0030	22.00288
20	20.0008	19.9983	20.0034	19.9989	20.00035
18	18.0122	18.0142	18.0152	18.0130	18.01365
16	16.0111	16.0124	16.0111	16.0124	16.01175
14	14.0164	14.0111	14.0131	14.0101	14.01268
12	12.0112	12.0174	12.0160	12.0129	12.01438
10	10.0291	10.0285	10.0294	10.0262	10.02830

SPECIMEN FROM 4".2 SHOT, CAST AT WATERTOWN ARSENAL SEPTEMBER 12, 1885.

No. 590.

Compression test.
Length, 4".005.
Diameter, ."798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000050	.000050	0.	.....	
1,500	3,000	.000100	.000050	0.	.....	
2,000	4,000	.000150	.000050	0.	.....	
2,500	5,000	.000250	.000100	0.	.....	
3,000	6,000	.000300	.000050	0.	.....	
3,500	7,000	.000400	.000100	0.	.....	
4,000	8,000	.000500	.000100	0.	.....	
4,500	9,000	.000550	.000050	0.	.....	
5,000	10,000	.000600	.000050	0.	.....	
5,500	11,000	.000700	.000100	0.	.....	
6,000	12,000	.000800	.000100	0.	.....	
6,500	13,000	.000900	.000100	0.	.....	
7,000	14,000	.000950	.000050	.000050	.000050	
7,500	15,000	.001000	.000050	.000100	.000050	
8,000	16,000	.001100	.000100	.000100	0.	
8,500	17,000	.001150	.000050	.000100	0.	
9,000	18,000	.001250	.000100	.000150	.000050	
9,500	19,000	.001300	.000050	.000150	0.	
10,000	20,000	.001400	.000100	.000150	0.	
10,500	21,000	.001450	.000050	.000200	.000050	
11,000	22,000	.001550	.000100	.000200	0.	
11,500	23,000	.001600	.000050	.000200	0.	
12,000	24,000	.001700	.000100	.000250	.000050	
12,500	25,000	.001750	.000050	.000250	0.	
13,000	26,000	.001850	.000100	.000250	0.	
13,500	27,000	.002000	.000150	.000300	.000050	
14,000	28,000	.002050	.000050	.000300	0.	
14,500	29,000	.002100	.000050	.000350	.000050	
15,000	30,000	.002250	.000150	.000350	0.	
15,500	31,000	.002350	.000100	.000450	.000100	
16,000	32,000	.002500	.000150	.000500	.000050	
16,500	33,000	.002550	.000050	.000500	0.	
17,000	34,000	.002650	.000100	.000550	.000050	
17,500	35,000	.002800	.000150	.000600	.000050	
18,000	36,000	.002900	.000100	.000700	.000100	
18,500	37,000	.003000	.000100	.000750	.000050	
19,000	38,000	.003200	.000200	.000900	.000150	
19,500	39,000	.003350	.000150	.000950	.000050	
20,000	40,000	.003500	.000150	.001100	.000150	
20,500	41,000	.003750	.000250	.001200	.000100	
21,000	42,000	.003900	.000150	.001300	.000100	
21,500	43,000	.004050	.000150	.001350	.000050	
22,000	44,000	.004300	.000250	.001600	.000250	
23,500	47,000	.005250	.000950	.002300	.000700	
24,000	48,000	.005400	.009150	.002450	.000150	
24,500	49,000	.005700	.000300	.002500	.000050	
25,000	50,000	.005950	.000250	.002750	.000250	
48,100	96,200	.....	.....	.....	.....	Ultimate strength.

† Manner of failure, crushed at one end.

SINGLE-RIVETED BUTT JOINTS, STEEL PLATE.

SINGLE-RIVETED BUTT JOINTS, STEEL PLATE.

DESCRIPTION OF TESTS AND DISCUSSION OF RESULTS.

'he following tests complete a series of two hundred and sixteen gle-riveted butt joints in steel plates, in which the thickness of the tes ranged from $\frac{1}{4}''$ to $\frac{3}{4}''$, and the size of the rivets from $\frac{9}{16}''$ to $1\frac{3}{16}''$ meter.

'he plates were annealed after shearing to size, the edges opposite joint milled to the finished width; the holes were drilled and rivets hine-driven. Iron rivets were used throughout, except in some of $\frac{3}{4}''$ joints.

'ensile tests of the plates and rivet metal, together with the tests of joints in $\frac{1}{4}''$ and $\frac{3}{8}''$ plate, are contained in the Report of Tests of 5, Senate Document No. 36, Forty-ninth Congress, first session.

'he tests herewith presented comprise the details and tabulation of ts in $\frac{1}{2}''$, $\frac{5}{8}''$, and $\frac{3}{4}''$ thickness of plate, a portion of which were tested

'he gauged length in which elongations and sets were measured was $2\frac{1}{2}''$ each side of the center line of the joint.

)uring the progress of testing the same characteristics were disyed which were referred to in the previous report. The joints were y rigid under the early loads. This rigidity is overcome by loads ich exceed the friction between the plate and covers, after which the etching proceeded slowly with some fluctuations till elongation of metal of the net section became general; the metal under compresn in front of the rivets yielding, also the rivets themselves.

'he behavior of joints in different thicknesses of plate is substantially same, and an examination of the results shows that when exposed similar conditions the strength per unit of fractured metal is nearly same, whether $\frac{1}{4}''$ or $\frac{3}{4}''$ plate is used.

t will not be understood from this, however, that as a consequence same efficiency may be obtained in different thicknesses of plate for gle-riveted work, because it will be seen that certain essential conions change as we approach the stronger joints in different thicksses of plate.

A riveted joint of the maximum efficiency should fracture the plate ng the line of riveting, for it is clear that if failure occurs in any ier manner, as by shearing the rivets or tearing out the plate in front the rivet holes, there remains an excess of strength along the line of eting, or in other words along the net section of metal—if in a single eted joint—which has not been made use of; but when fracture occurs ng the net section an excess of strength in other directions is immaial.

If the strength per unit of metal of the net section was constant, it uld be a very simple matter to compute the efficiency of any joint, as would merely be the ratio of the net to the gross areas of the plates. The tenacity of the net section, however, varies, and this variation tends over wide limits.

In the present series there is an excess in strength of the net section over the strength of the tensile test pieces in all joints.

Special tables have been prepared showing this behavior.

The efficiencies shown in Table No. 1 are obtained by dividing the tensile stress on the gross area of plate by the tensile strength of the plate as represented by the strength of the tensile test strip, stating the values in per cent. of the latter.

Table No. 2 exhibits the differences between the efficiencies of the joints and the ratios of net to gross areas of plate. If the tenacity of net section remained constant per unit of area, the efficiencies in Table No. 1 would, as above explained, be identical with the ratios of net to gross areas of plate, and the values in this table reduced to zero.

Table No. 3 shows the excess in strength of the net section of the joint over the strength of the tensile test strip in per cent. of the latter.

Table No. 4 exhibits the compression on the bearing surface of the rivets in connection with the excess in tensile strength of the net section of plate.

Table No. 1 is valuable in showing at once the value of different joints wherein the pitch of the rivets and their diameters vary.

It is seen there is considerable latitude allowed in the choice of rivets and pitch without materially changing the efficiency of the joint; thus in $\frac{1}{4}''$ plate,

$\frac{5}{8}''$ rivets (driven), $1\frac{7}{8}''$ pitch, 72.4 per cent. efficiency,
$\frac{3}{4}''$ rivets (driven), $2\frac{1}{4}''$ pitch, 73.3 per cent. efficiency,
$\frac{7}{8}''$ rivets (driven), $2\frac{5}{8}''$ pitch, 71.5 per cent. efficiency,
$1''$ rivets (driven), $2\frac{1}{2}''$ pitch, 70.3 per cent. efficiency,
$1''$ rivets (driven), $2\frac{7}{8}''$ pitch, 73.8 per cent. efficiency,

give nearly the same results.

In these examples the ratios of net to gross areas of plate range from 60 to 67 per cent., while the rivet areas range from .3067 square inch to .7854 square inch. The actual areas of net sections of plate and rivets are as follows:

	$\frac{5}{8}''$ rivets.	$\frac{3}{4}''$ rivets.	$\frac{7}{8}''$ rivets.	$1''$ rivets.
	Square inches.	*Square inches.*	*Square inches.*	*Square inches.*
Rivets	.3067	.4418	.6013	.7854
Plate	1.486	2.207	2.232	2.259 2.319

The areas of the rivets stand to each other as the following numbers:

100 144 196 256

and the net areas of the plate to each other as

100 149 150 152
156

From these illustrations it appears that to attain the same degree of efficiency in this quality of metal, although that efficiency is probably not the highest attainable, a fixed ratio between rivet metal and net section of plate is not essential.

In $\frac{1}{2}''$ plate with $\frac{7}{8}''$ rivets the efficiencies of the joints tested cold are nearly constant over the range of pitches tested.

The efficiencies and the ratio of net to gross areas of plate are as follows:

	Pitch.			
	1⅞″	2″	2⅛″	2¼″
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Efficiency	64.5	66.3	66.3	66.4
Ratio of areas	53.4	56.3	58.9	61.1

In this we have illustrated a case which, in passing from the widest pitch, having 61.1 per cent. of the solid plate left, to the narrowest pitch, which had 53.4 per cent. of the solid plate, the gain or excess in strength in the net section almost exactly compensated for the loss of metal.

In Table No. 3 the average of all the joints shows the highest per cent. of excess of strength in the narrowest pitch, and a tendency to lose this excess as the pitch increases.

Tests of detached grooved specimens show the same kind of behavior, but as they are not subject to all the conditions found in a joint, the analogy does not extend very far.

The maximum gain in strength on the net section, not for the time being regarding the hot joints, and disregarding the exceptionally high value of joint No. 1339, ¼″ plate, was 21.2 per cent., the minimum value 2.5 per cent. of the tensile test strip. In other forms of joints, and with punched holes in both iron and steel plate, illustrations are numerous in which there have been large deficiencies, the metal of the net section falling far below the strength of the plate.

It is believed to have been amply shown that increasing the net width diminishes the apparent tenacity of the plate, although other influences may tend to counteract this tendency in some joints.

In order to compare the excess in strength of one thickness of plate with another having the same net widths, we have the following table, rejecting those joints that failed otherwise than along the line of riveting in making these averages:

Thickness of plate.	Width of plate between rivet holes.								
	1″	1⅛″	1¼″	1⅜″	1½″	1⅝″	1¾″	1⅞″	2″
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
¼″	16.7	12.6	11.4	12.0	13.4	8.9	11.5	13.1	10.6
⅜″	18.4	13.7	12.7	13.5	14.6	12.9	9.0	13.6	.....
½″	16.7	14.3	9.3	10.7	9.1	8.8	8.2	12.2	.....
⅝″	17.7	16.3	14.2	14.5	14.6	12.7	9.9	9.8	.....
¾″	11.4	15.1	13.8	14.1	7.6	11.8	10.0	10.1	3.5
Average of all thicknesses	16.2	14.4	12.3	12.9	11.9	11.0	9.7	11.8	7.0

The excess in strength is generally well maintained in each of the several thicknesses, and were it possible to retain the same ratio of net to gross areas of plate, and at the same time equal net widths between rivets, it would seem from this point of view feasible to obtain the same degree of efficiency in thick as in thin plates.

The following causes, however, tend to prevent such a consummation.

For equal net widths thick plates require larger rivets to avoid shearing than thin ones, the diameters of the rivets being somewhat increased for this cause, and again because it has become necessary to increase the metal of the net section in order to retain a suitable ratio of net to gross areas of plate.

There results from these considerations such an increase in net width of plate that the excess in strength displayed by narrower sections is lost, and consequently the result is a joint of lower efficiency.

The data relating to the influence of compression on the bearing surface of the rivets, on the tensile strength of the plate, as shown by Table No. 4 are more or less conflicting. However, in the ¼″ plate, in which the most intense pressures are found, there is seen a pronounced increase in tensile strength as the pressures diminish in intensity.

It is probable that the effects of intense compression would be more conspicuous in a less ductile metal, or one in which the ductility had been impaired by punched holes or otherwise.

A number of joints were tested at temperatures ranging between 200° and 700° Fahr.

The heating was done after the joints were in position for testing, by means of Bunsen burners, arranged in a row parallel to and under the line of riveting.

The temperature was determined with a mercurial thermometer, the bulb of which was immersed in a bath of oil, contained in a pocket drilled in the middle rivet of the joint.

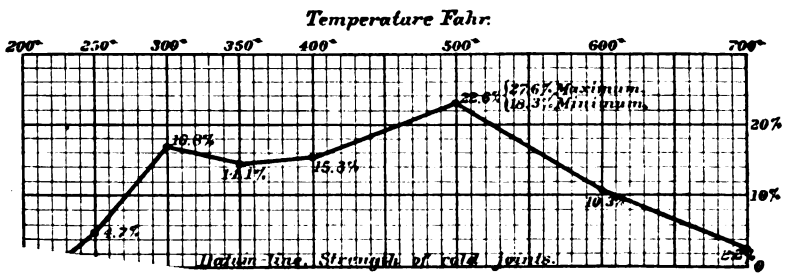
When at the required temperature the thermometer was removed from the joint, a dowel was driven into the pocket to compensate for the metal of the rivet which had been removed by the drill, and then loads applied and gradually increased up to the time of rupture.

Three joints, Nos. 1423, 1426, and 1430, were tested without dowels in the oil pockets.

The method of heating was to raise the temperature of the joint, as shown by the thermometer, a few degrees above the temperature at which the test was made, shut off the gas burners, and allow the temperature to fall to the required limit. The temperature fell slowly, draughts of cold air being excluded from the under side of the joint by the hood which covered the gas burners; the upper side and edges of the joint were covered with fine dry coal ashes.

The results show an increase in tensile strength when heated over the duplicate cold joints at each temperature except 200° Fahr.

From 200° there was a gain in strength up to 300°, when the resistance fell off some at 350°, increased again at 400°, and reached the maximum effect observed at 500° Fahr.; from this point the strength fell rapidly at 600° and 700°.



In per cent. of the cold joint there was a loss at 200° of 3.2 per cent., the average of three joints; at 500° the gain was 22.6 per cent., the average of four joints. The maximum and minimum joints at this temperature showed gains of 27.6 per cent. and 18.3 per cent., respectively.

The highest tensile strength on the net section of plate was found in joint No. 1433, tested at 500° Fahr., where 81,050 pounds per square inch was reached against a strength of 58,000 pounds per square inch in the cold tensile test strip.

The hot joints showed less ductility than the cold ones, those tested at 200° Fahr. not being exempt from this behavior, although there was no near approach to brittleness in any.

Three joints, Nos. 1418, 1420, and 1424, were heated; strained when hot with loads exceeding the ultimate strength of their duplicate cold joints; the loads were released, and after having cooled to the temperature of the testing-room (No. 1424 cooled to 150° Fahr.) were tested to rupture and were found to have retained substantially the strength due their temperature when hot.

In order to ascertain that the time intervening between hot straining and final rupture did not contribute towards the elevation in strength, joint No. 1434 was strained in a similar manner with a load approaching rupture, after which a period of rest was allowed and then ruptured without material gain in strength.

A peculiarity of the joints fractured at 400° and higher temperatures was the comparatively smooth surface of the fractured sections, and which took place in planes making angles of about 50° with the rolled surface of the plate.

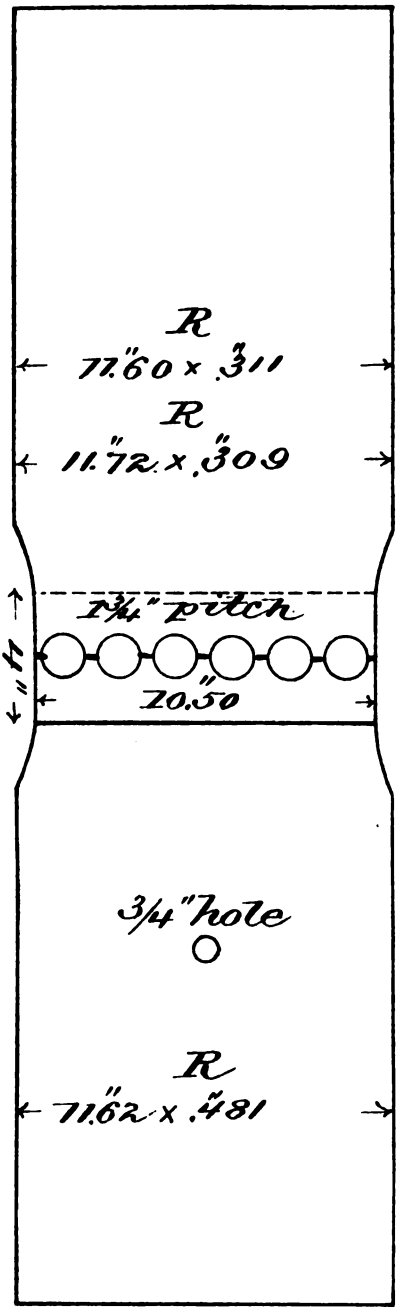
The shearing strength of the iron rivets was also increased by an elevation of temperature.

The rivets in joint No. 1410 at the temperature of 350° sheared at 43,060 pounds per square inch, while in the duplicate cold joint No. 1411 they sheared at 38,530 pounds per square inch, and the rivets in joint No. 1398 at 300° Fahr. were loaded with 46,820 pounds per square inch and did not shear.

Other examples, where some of the rivets sheared and the plate fractured in part, showed corresponding gains in shearing strength.

The almost entire absence of granular fractures in these tests is a feature too important to pass by without special mention.

No. 1396



½" steel plate.

H Ex 31 49 2

DETAILS OF TESTS OF RIVETED JOINTS.

Areas.

s sectional area	square inches	5.051
ectional area	do	2.886
ing surface of rivets	do	2.165
aring area	do	5.301

[Tested at temperature of 200° Fahr.]

lied loads.		In gauged length.		Remarks.
	Per square inch.	Elongation.	Set.	
	Pounds.	*Inch.*	*Inch.*	
)	37,750	.....	.....	Tensile strength.

ured plate along line of riveting.
at fracture (one section), ″.84×″.31=.2604 square inch.
action, 45.8 per cent.
arance silky, slight lamination; open at edges, ″.03 and ″.07.
gation of rivet holes, ″.35, ″.36, ″.36, ″.37, ″.38, ″.39.

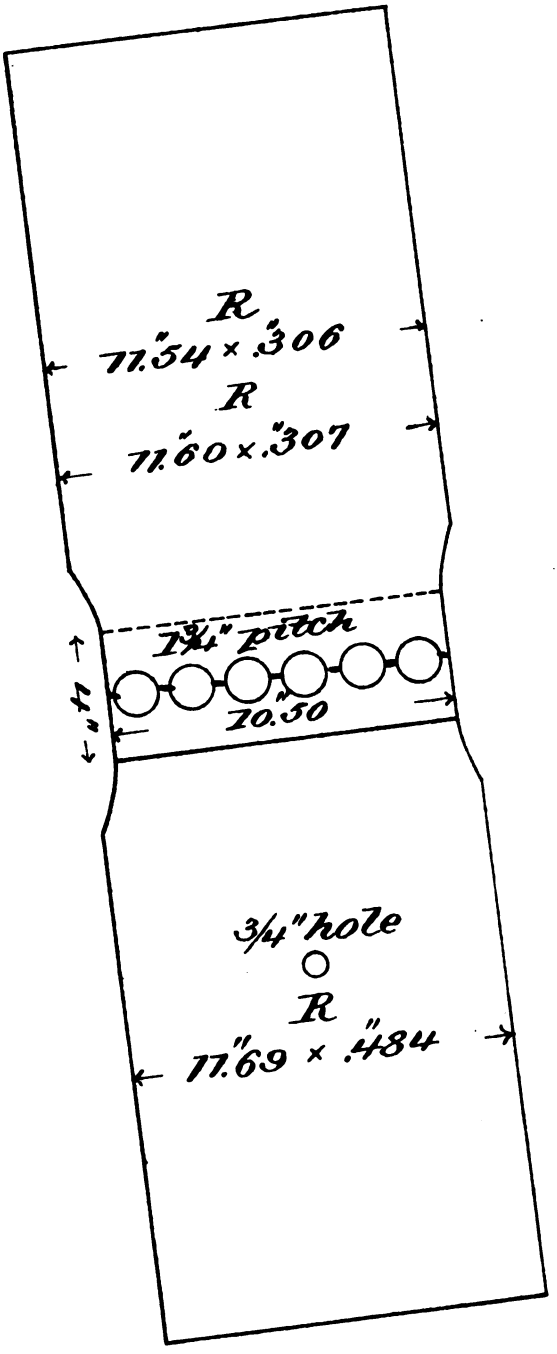
Maximum stress on joint.

gross section of plate	pounds per square inch	37,750
net section of plate	do	66,070
on on bearing surface of rivets	do	88,080
n rivets	do	35,970

y of joint, 66.1 per cent.

No. 7397

7/8" steel plate.



H Ex 31 492

Areas.

oss sectional area	square inches..	5.082
t sectional area	do....	2.904
aring surface of rivets	do....	2.178
ihearing area	do....	5.301

pplied loads.		In ganged length.		Remarks.
d.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
2	1,000	0.	0.	Initial load.
4	2,000	.0002	.....	
6	3,000	.0003	.....	
8	4,000	.0005	.....	
0	5,000	.0006	.0002	
2	6,000	.0007	.....	
4	7,000	.0012	.....	
6	8,000	.0020	.....	
8	9,000	.0043	.....	
0	10,000	.0050	.0042	
2	11,000	.0054	.....	
4	12,000	.0057	.....	
6	13,000	.0063	.....	
8	14,000	.0067	.....	
0	15,000	.0071	.0053	
2	16,000	.0080	.....	
4	17,000	.0085	.....	
6	18,000	.0102	.....	
8	19,000	.0115	.....	
0	20,000	.0123	.0092	
2	21,000	.0140	.....	
4	22,000	.0144	.....	
6	23,000	.0152	.....	
8	24,000	.0163	.....	
0	25,000	.0178	.0131	
2	26,000	.0220	.....	
4	27,000	.0260	.....	
6	28,000	.0336	.....	
8	29,000	.0418	.....	
0	30,000	.0525	.....	
2	31,000	.0635	.....	
4	32,000	.0755	.....	
6	33,000	.0895	.....	
8	34,000	.1090	.....	
0	35,000	.15	.....	
2	36,000	.17	.....	
4	37,000	.19	.....	
6	38,000	.23	.....	
0	38,980	.32	.....	Tensile strength.

ctured plate along line of riveting.
earance silky lamellar; open at edges, ″.10 and ″.08.
ngation of rivet holes, ″.41, ″.41, ″.39, ″.39, ″.39, ″.40.
a at fracture (one section), ″.85×″.30=.2550 square inch.
traction, 47.3 per cent.

Maximum stress on joint.

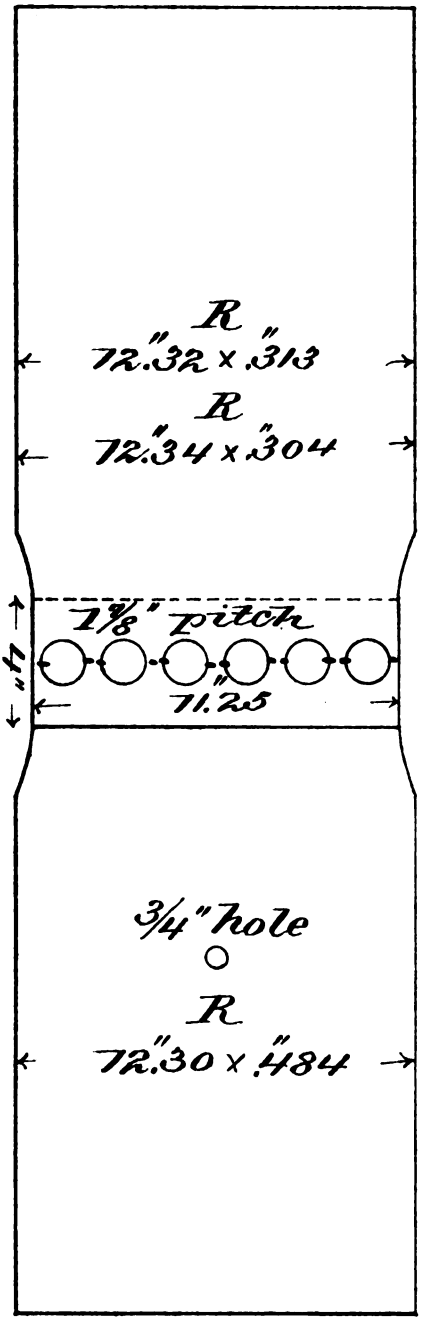
on gross section of plate	pounds per square inch..	38,980
on net section of plate	do....	68,220
sion on bearing surface of rivets	do....	90,960
on rivets	do....	37,370

ncy of joint, 68.1 per cent.

H EX 3 \ 10 5

No. 7398

½" steel plate.



H Ex 31 492

Areas.

ectional area	square inches	5.445
tional area	do	3.267
surface of rivets	do	2.178
ng area	do	5.301

[Tested at temperature of 300° Fahr.]

loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
45,560	.....	.....	Tensile strength.

l the rivets.

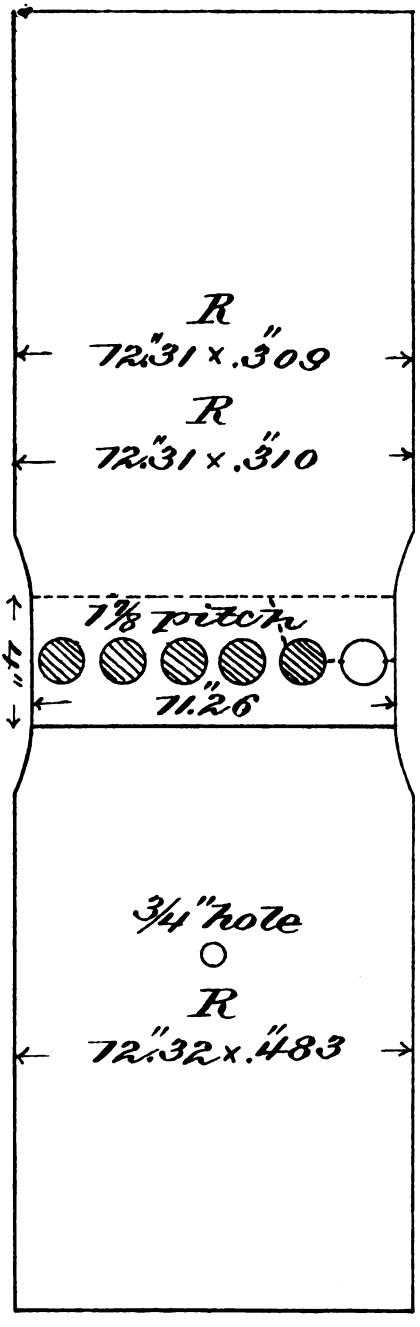
tion of rivet holes, ".22, ".14, ".14, ".14, ".14, ".14.

Maximum stress on joint.

oss section of plate	pounds per square inch	45,560
t section of plate	do	75,960
on bearing surface of rivets	do	113,960
ivets	do	46,820

No. 13.99

½" steel plate



H Ex 31 49 2

Areas.

sectional area	square inches	5.439
ctional area	do	3.266
ng surface of rivets	do	2.173
ring area	do	5.301

ied loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0003	.....	
3,000	.0004	.....	
4,000	.0008	.....	
5,000	.0010	.0004	
6,000	.0013	.....	
7,000	.0019	.....	
8,000	.0043	.....	
9,000	.0049	.....	
10,000	.0057	.0042	
11,000	.0063	.....	
12,000	.0072	.....	
13,000	.0078	.....	
14,000	.0072	.....	
15,000	.0091	.0062	
16,000	.0098	.....	
17,000	.0109	.....	
18,000	.0121	.....	
19,000	.0131	.....	
20,000	.0142	.0093	
21,000	.0163	.....	
22,000	.0175	.....	
23,000	.0200	.....	
24,000	.0247	.....	
25,000	.0392	.0322	
26,000	.0520	.....	
27,000	.0610	.....	
28,000	.0720	.....	
29,000	.0836	.....	
30,000	.0930	.....	
31,000	.1085	.....	
32,000	.14	.....	
33,000	.16	.....	
34,000	.18	.....	
35,000	.20	.....	
36,000	.24	.....	
37,000	.28	.....	
38,000	.35	.....	
39,000	.40	.....	
39,260	.....	.....	Tensile strength.

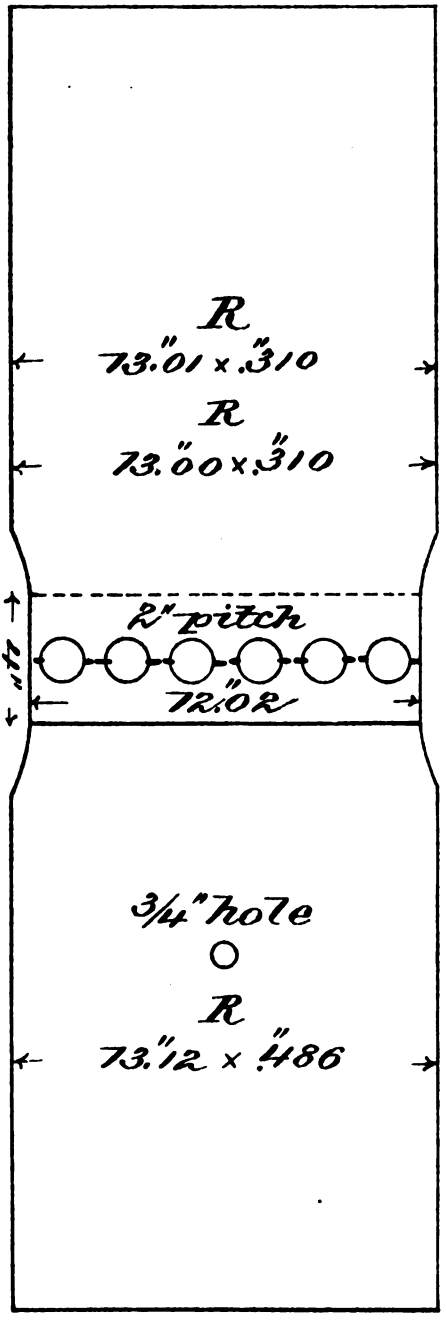
ured plate through two sections and sheared five rivets.
rance of fractured plate, silky.
ge elongation of rivet-holes, ".23.

Maximum stress on joint.

gross section of plate	pounds per square inch	39,260
net section of plate	do	65,400
on bearing surface of rivets	do	98,290
rivets	do	40,290

of joint, 68.6 per cent.

No. 1400



1/2" steel plate.

H Ex 31 49 2

Areas.

sectional area	square inches	5.842
ctional area	do	3.655
ıg surface of rivets	do	2.187
ring area	do	5.301

ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	—.0002	.....	
3,000	—.0002	.....	
4,000	—.0001	.....	
5,000	—.0003	.0002	
6,000	—.0002	.....	
7,000	0.	.....	
8,000	.0012	.....	
9,000	.0016	.....	
10,000	.0018	.0032	
11,000	.0027	.....	
12,000	.0031	.....	
13,000	.0034	.....	
14,000	.0041	.....	
15,000	.0057	.0071	
16,000	.0071	.....	
17,000	.0078	.....	
18,000	.0101	.....	
19,000	.0104	.....	
20,000	.0106	.0102	
21,000	.0107	.....	
22,000	.0117	.....	
23,000	.0125	.....	
24,000	.0144	.....	
25,000	.0173	.0143	
26,000	.0241	.....	
27,000	.0287	.....	
28,000	.0380	.....	
29,000	.0483	.....	
30,000	.0575	.....	
31,000	.0703	.....	
32,000	.0843	.....	
33,000	.1030	.....	
34,000	.115	.....	
35,000	.135	.....	
36,000	.18	.....	Scale starts off plate.
37,000	.22	.....	Tensile strength.

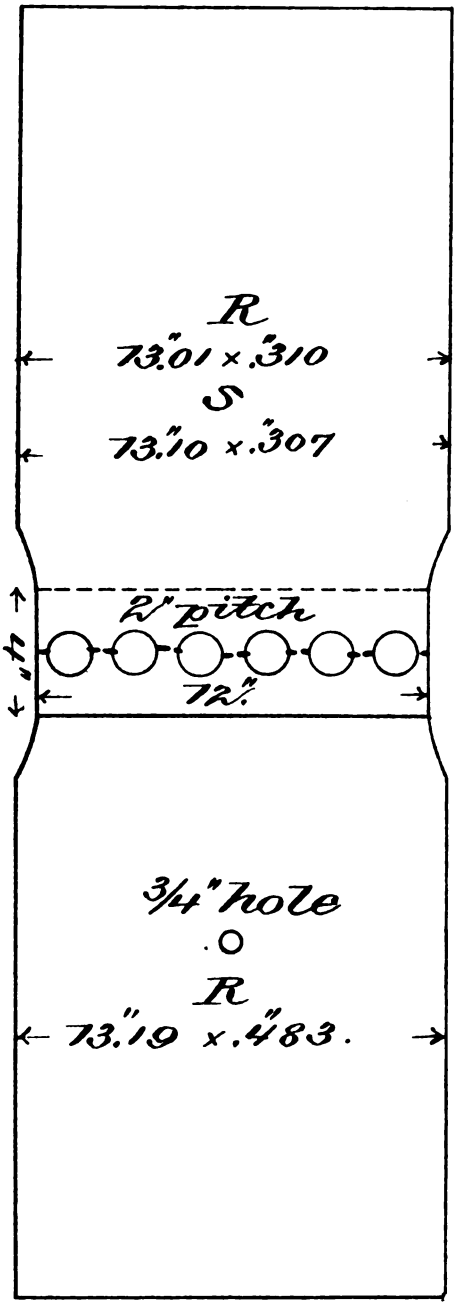
ed the rivets between plate and top cover.
ation of rivet-holes, ″.15, ″.15, ″.15, ″.09, ″.09, ″.12.

Maximum stress on joint

gross section of plate	pounds per square inch	37,000
net section of plate	do	59,140
n on bearing surface of rivets	do	98,830
ı rivets	do	40,770

· of joint, 64.7 per cent.

No. 1401



1/2" Steel Plate.

H Ex 31 49 2

Areas.

ross sectional area	square inches	5.796
et sectional area	do	3.622
earing surface of rivets	do	2.174
shearing area	do	5.301

[Tested at temperature of 350° Fahr.]

Applied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
500	39,420	.....	.....	Tensile strength.

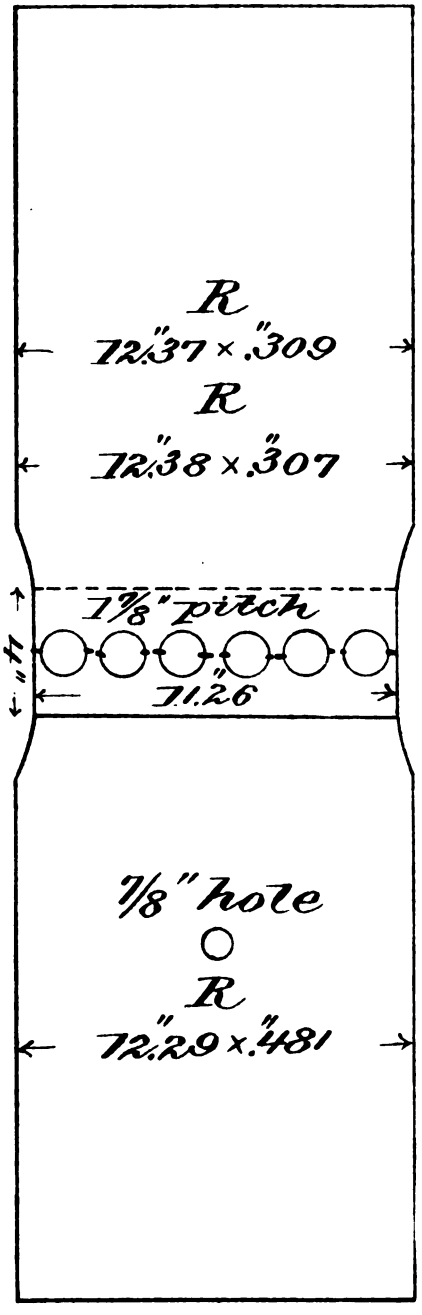
eared the rivets.
ongation of rivet-holes, ″.08 each.

Maximum stress on joint.

n on gross section of plate	pounds per square inch	39,420
n on net section of plate	do	63,080
ession on bearing surface of rivets	do	105,100
g on rivets	do	43,100

No. 1402

1/2" Steel plate.



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	5.416
Plate, net sectional area	do	2.891
Plate, bearing surface of rivets	do	2.525
Rivets, shearing area	do	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,416	1,000	0.	0.	Initial load.
10,833	2,000	.0002	.....	
16,248	3,000	.0005	.....	
21,664	4,000	.0005	.....	
27,080	5,000	.0011	.0002	
32,496	6,000	.0017	.....	
37,912	7,000	.0020	.....	
43,328	8,000	.0026	.....	
48,744	9,000	.0030	.....	
54,160	10,000	.0037	.0030	
59,576	11,000	.0048	.....	
64,992	12,000	.0056	.....	
70,408	13,000	.0062	.....	
75,824	14,000	.0069	.....	
81,240	15,000	.0075	.0053	
86,656	16,000	.0082	.....	
92,072	17,000	.0090	.....	
97,488	18,000	.0099	.....	
102,904	19,000	.0112	.....	
108,320	20,000	.0124	.0092	
113,736	21,000	.0142	.....	
119,152	22,000	.0152	.....	
124,568	23,000	.0172	.....	
129,984	24,000	.0198	.....	
135,400	25,000	.0244	.0185	
140,816	26,000	.0315	.....	
146,232	27,000	.0362	.....	
151,648	28,000	.0422	.....	
157,064	29,000	.0497	.....	
162,480	30,000	.0585	.0497	
167,896	31,000	.0707	.....	
173,312	32,000	.0830	.....	
178,728	33,000	.0997	.....	
184,144	34,000	.1192	.....	
189,560	35,000	.16	.....	
194,976	36,000	.20	.....	
199,800	36,890	.27	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar.
Area at fracture (one section) ″.84×″.32=.2688 square inch.
Contraction, 44.1 per cent.
Fracture open at edges ″.17 and ″.10.
Elongation of rivet-holes, ″.48, ″.44, ″.39, ″.38, ″.37, ″.38.

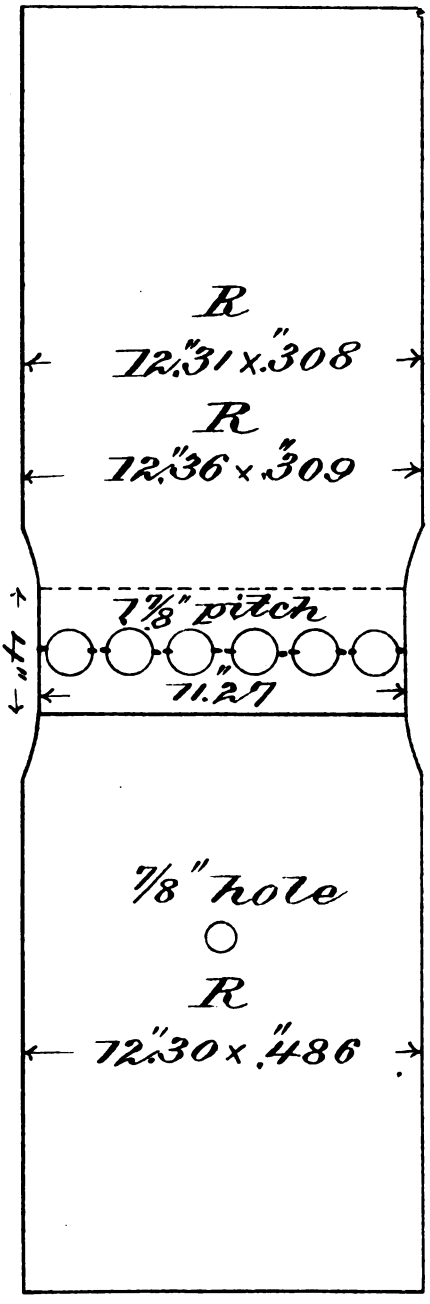
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,890
Tension on net section of plate	do	69,110
Compression on bearing surface of rivets	do	79,130
Shearing on rivets	do	27,690

Efficiency of joint, 64.5 per cent.

No. 1403

7/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	5.477
Plate, net sectional area	do	2.926
Plates, bearing surface of rivets	do	2.551
Rivets, shearing area	do	7.216

[Tested at temperature of 250° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
209,500	38,250	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar, irregular surface.
Area at fracture (one section), ″.86×″.34=.2924 square inch.
Contraction, 39.8 per cent.
Elongation of rivet-holes, ″.32, ″.31, ″.29, ″.30, ″.31, ″.32.

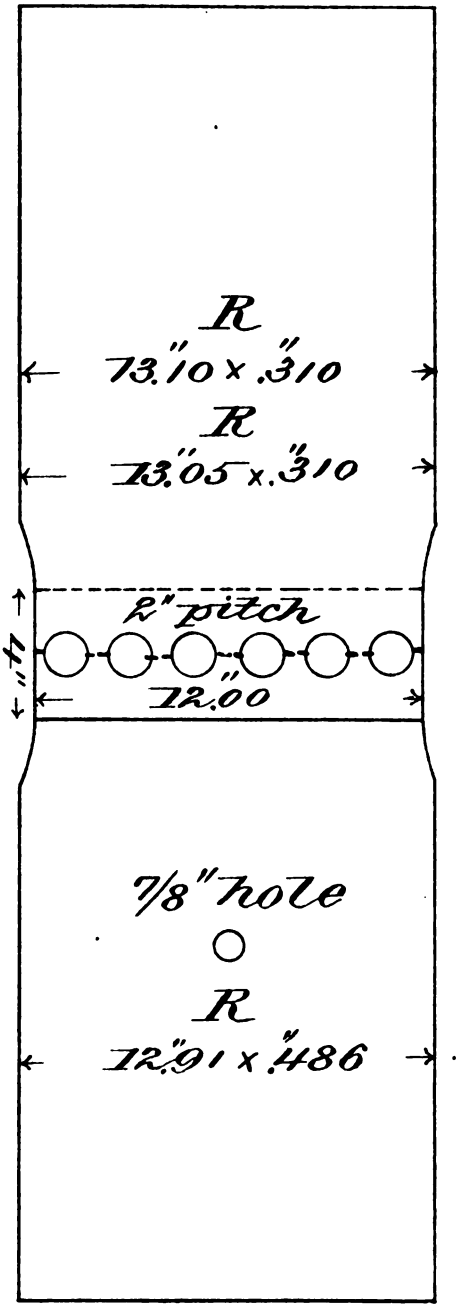
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,250
Tension on net section of plate	do	71,600
Compression on bearing surface of rivets	do	81,730
Shearing on rivets	do	29,030

Efficiency of joint, 66.9 per cent.

No. 1404

½" Steel plate



H Ex 31 49 2

Areas.

gross sectional area	square inches..	5.832
net sectional area	do....	3.281
bearing surface of rivets	do....	2.551
, shearing area	do....	7.216

Applied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
832	1,000	0.	0.	Initial load.
664	2,000	.0002	.....	
496	3,000	.0003	.....	
328	4,000	.0008	.....	
160	5,009	.0008	.0003	
992	6,000	.0013	.....	
824	7,000	.0013	.....	
656	8,000	.0018	.....	
488	9,000	.0021	.....	
320	10,000	.0030	.0023	
152	11,000	.0036	.....	
984	12.000	.0044	.....	
816	13,000	.0051	.....	
648	14,000	.0061	.....	
480	15,000	.0068	.0050	
312	16,000	.0073	.....	
144	17.000	.0083	.....	
976	18,000	.0092	.....	
808	19,000	.0103	.....	
640	20,000	.0115	.0080	
472	21,000	.0128	.....	
304	22,000	.0137	.....	
136	23,000	.0148	.....	
968	24,000	.0166	.....	
800	25,000	.0188	.0139	Scale starts off plate.
632	26,000	.0231	.....	
464	27,000	.0276	.....	Edges of plate contract.
296	28,000	.0343	.....	
128	29,000	.0423	.....	
960	30,000	.0542	.....	
792	31,000	.0743	.....	
624	32,000	.0923	.....	
456	33,000	.1118	.....	
288	34,000	.15	.....	
120	35,000	.19	.....	
952	36,000	.20	.....	
784	37,000	.26	.....	
100	37,910	.....	.....	Tensile strength.

actured along line of riveting.

pearance of fracture, silky, lamellar. Open at edges ″.15 and ″.10.

ngation of rivet-holes, ″.47, ″.47, ″.42, ″.42, ″.46, ″.46.

ea at fracture (one section), ″.93×″.28=.2604 square inch.

ntraction, 52.3 per cent.

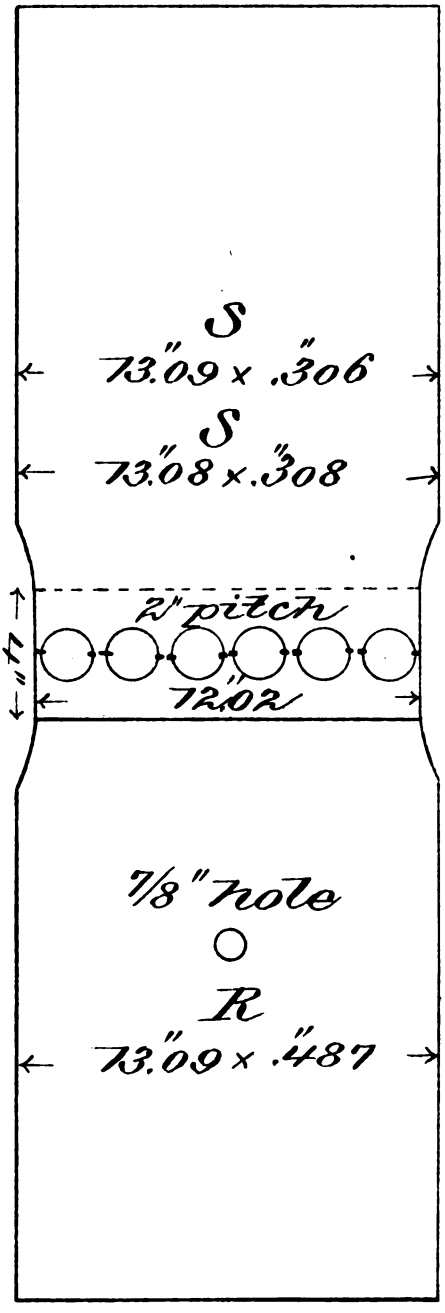
Maximum stress on joint.

a on gross section of plate	pounds per square inch..	37,910
a on net section of plate	do....	67,380
sion on bearing surface of rivets	do....	86,670
g on rivets	do....	30,640

ency of joint, 66.3 per cent.

No. 7405

½" steel plate



H Ex 31 49 2

Areas.

ate, gross sectional area	square inches..	5.854
ate, net sectional area	do...	3.297
ate, bearing surface of rivets	do...	2.557
vets, shearing area	do...	7.216

[Tested at temperature of 300° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
256,000	43,730	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance silky, slight lamination. Open at edges ″.04 and ″.02.
Area at fracture (one section), 1″.01×″.37=.3737 square inch.
Contraction 31.7 per cent.
Elongation of rivet-holes, ″.33, ″.31, ″.29, ″.28, ″.29, ″.31.

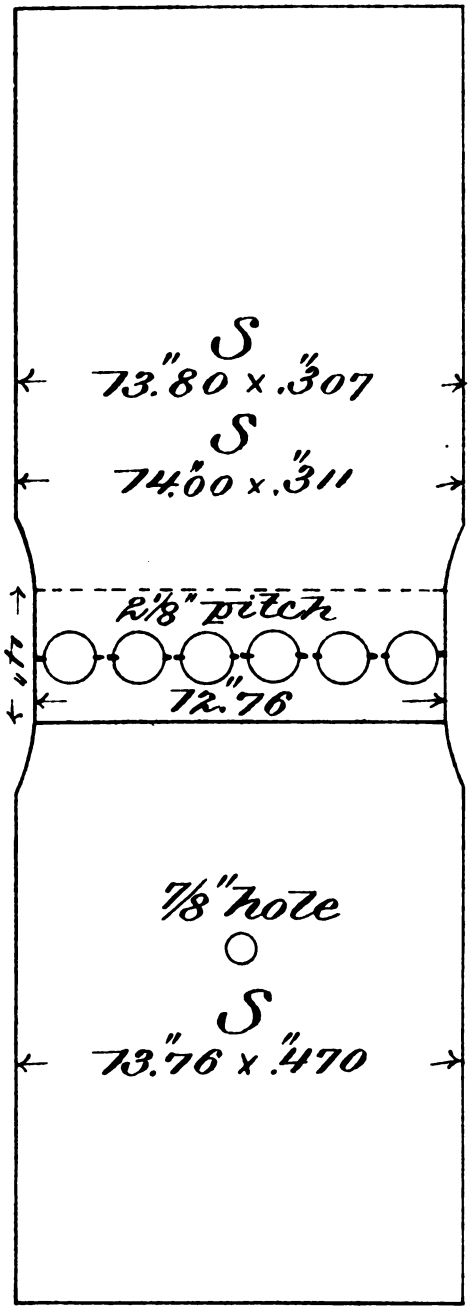
Maximum stress on joint.

nsion on gross section of plate	pounds per square inch..	43,730
nsion on net section of plate	do...	77,650
mpression on bearing surface of rivets	do...	100,120
earing on rivets	do...	35,480

Efficiency of joint, 76.4 per cent.

No. 1406

1½" Steel Plate



H Ex 31 49 2

Areas.

ional area	square inches	5.997
nal area	do	3.529
urface of rivets	do	2.468
area	do	7.216

[Tested at a temperature of 400° Fahr.]

oads.	In ganged length.		Remarks.
r square inch.	Elongation.	Set.	
'ounds.	*Inch.*	*Inch.*	
44, 790	.....	.....	Tensile strength.

d plate along line of riveting.
nce, silky, slight lamination.
s oblique, making an angle of 50° with surface of plate.
ges ″.03 and ″.17.
racture (one section), 1″.14×″.36=.4104 square inch.
on, 30.1 per cent.
on of rivet-holes, ″.34, ″.33, ″.32, ″.34, ″.37, ″.40.

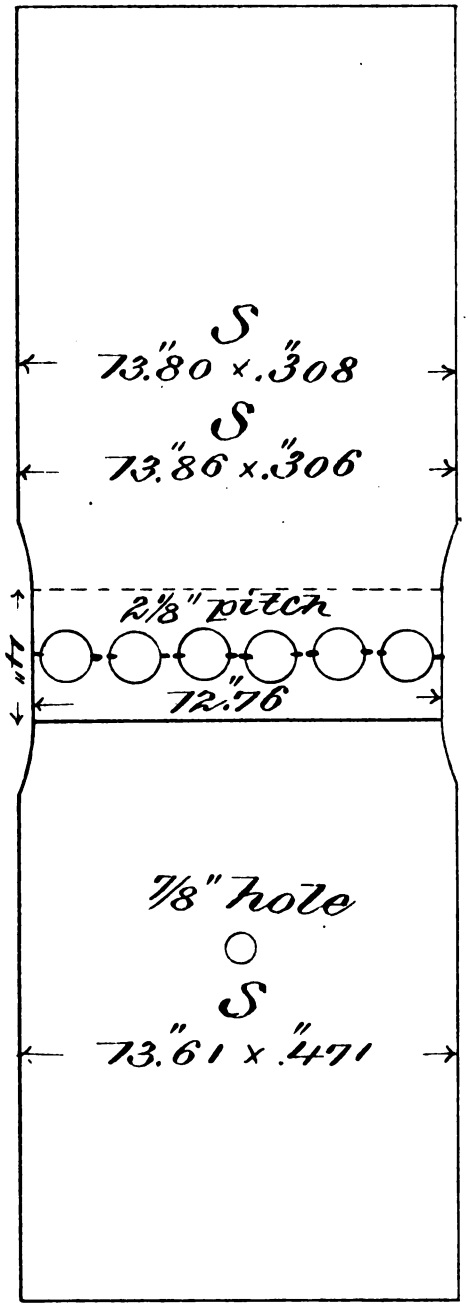
Maximum stress on joint.

s section plate	pounds per square inch	44, 790
section plate	do	76, 110
bearing surface of rivets	do	108, 830
ets	do	37, 220

oint, 76.7 per cent.

No. 7401

½" Steel Plate



H Ex 31 49 2

Areas.

sectional area	square inches..	6.010
ctional area	do....	3.537
ng surface of rivets	do....	2.473
ring area	do....	7.216

ed loads.	In ganged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0002	.....	
3,000	.0003	.....	
4,000	.0005	.....	
5,000	.0007	.0003	
6,000	.0012	.....	
7,000	.0020	.....	
8,000	.0029	.....	
9,000	.0036	.....	
10,000	.0043	.0032	
11,000	.0051	.....	
12,000	.0058	.....	
13,000	.0063	.....	
14,000	.0071	.....	
15,000	.0081	.0056	
16,000	.0095	.....	
17,000	.0106	.....	
18,000	.0116	.....	
19,000	.0122	.....	
20,000	.0130	.0091	
21,000	.0141	.....	
22,000	.0151	.....	
23,000	.0161	.....	
24,000	.0176	.....	
25,000	.0196	.0133	
26,000	.0221	.....	
27,000	.0255	.....	
28,000	.0380	.....	
29,000	.0580	.....	
30,000	.0724	.0625	
31,000	.0905	.....	
32,000	.1050	.....	
33,000	.125	.....	
34,000	.14	.....	
35,000	.17	.....	
36,000	.21	.....	
37,000	.26	.....	
38,000	.31	.....	
39,000	.39	.....	
39,210	.42	.....	Tensile strength.

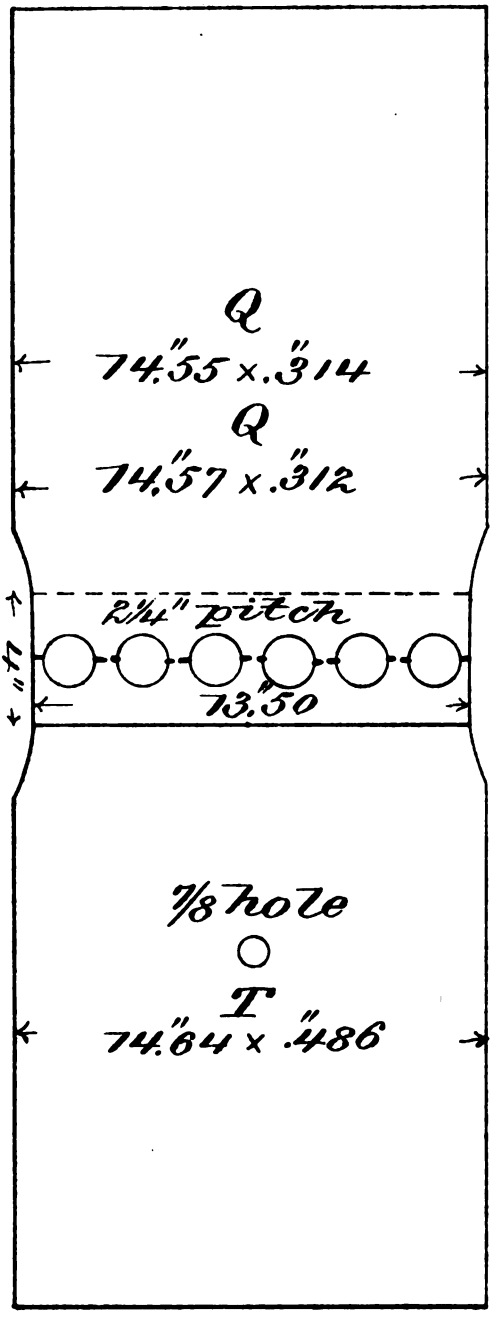
ired plate along line of riveting.
rance, silky, slightly lamellar. Open at edges, ″.20 and ″.15.
ation of rivet-holes, ″.58, ″.54, ″.52, ″.50, ″.54, ″.56.
t fracture (one section), 1″.04×″.29=.3016 square inch.
ction, 48.7 per cent.

Maximum stress on joint.

gross section of plate	pounds per square inch..	39,210
net section of plate	do....	66,630
on bearing surface of rivets	do....	95,310
rivets	do....	32,660

of joint, 66.3 per cent.

No. 7408



7/8" steel plate

H Ex 31 49 2

Areas.

'late, gross sectional area	square inches..	6.56
'late, net sectional area	do....	4.010
'late, bearing surface of rivets	do....	2.551
:ivets, shearing area	do...	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,561	1,000	0.	0.	Initial load.
13,122	2,000	—.0001	.....	
19,683	3,000	—.0001	.....	
26,244	4,000	—.0001	.....	
32,805	5,000	.0000	.0001	
39,366	6,000	.0013	.....	
45,927	7,000	.0030	.....	
52,488	8,000	.0037	.....	
59,049	9,000	.0042	.....	
65,610	10,000	.0047	.0044	
72,171	11,000	.0054	.....	
78,732	12,000	.0058	.....	
85,293	13,000	.0067	.....	
91,854	14,000	.0081	.....	
98,415	15,000	.0094	.0084	
104,976	16,000	.0111	.....	
111,537	17,000	.0118	.....	
118,098	18,000	.0124	.....	
124,659	19,000	.0130	.....	
131,220	20,000	.0137	.0108	
137,781	21,000	.0146	.....	
144,342	22,000	.0154	.....	
150,903	23,000	.0162	.....	
157,464	24,000	.0173	.....	
164,025	25,000	.0191	.0145	
170,586	26,000	.0227	.....	
177,147	27,000	.0310	.....	
183,708	28,000	.0550	.....	
190,269	29,000	.0661	.....	
196,830	30,000	.0850	.....	
203,391	31,000	.0985	.....	
209,952	32,000	.1170	.....	
216,513	33,000	.125	.....	
223,074	34,000	.17	.....	
229,635	35,000	.20	.....	
236,196	36,000	.22	.....	Scale starts off plate.
242,757	37,000	.27	.....	
249,318	38,000	.33	.....	
255,879	39,000	.40	.....	
261,500	39,850	.....	.....	Tensile strength.

'ractured plate along line of riveting.
ppearance, silky. Open at edges, ″.15 and ″.20.
'ongation of rivet-holes, ″.66, ″.66, ″.60, ″.60, ″.65, ″.67.
'ea at fracture (one section), 1″.14×″.28=.3192 square inch.
ntraction, 52.2 per cent.

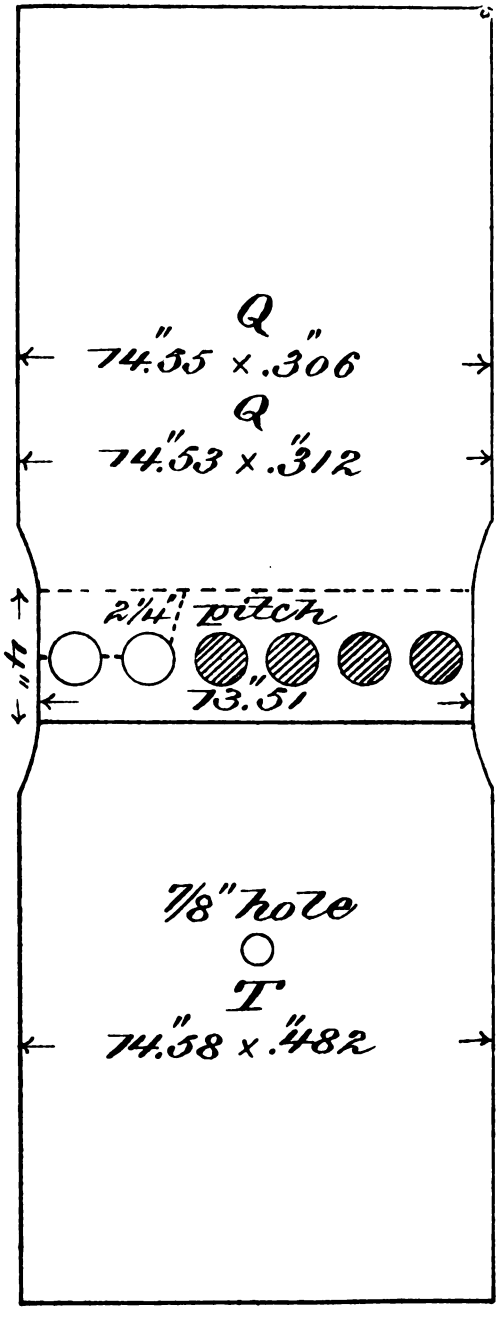
Maximum stress on joint.

m gross section of plate	pounds per square inch..	39,850
m net section of plate	do....	65,210
ion on bearing surface of rivets	do....	102,500
m rivets	do....	36,230

y of joint, 66.4 per cent.

No. 7409

7/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.512
Plate, net sectional area	do....	3.982
Plate, bearing surface of rivets	do....	2.530
Rivets, shearing area	do....	7.216

[Tested at temperature of 500° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
303,500	46,610	.....	.....	Tensile strength.

Sheared four rivets and fractured the plate across two sections back of center line of rivet-holes.

Appearance, silky, oblique.

Elongation of rivet-holes, ″.21 each where rivets sheared; other two, ″.38 and ″.36.

Area at fracture (one section), 1″.26 × ″.40 = .504 square inch.

Contraction, 23.9 per cent.

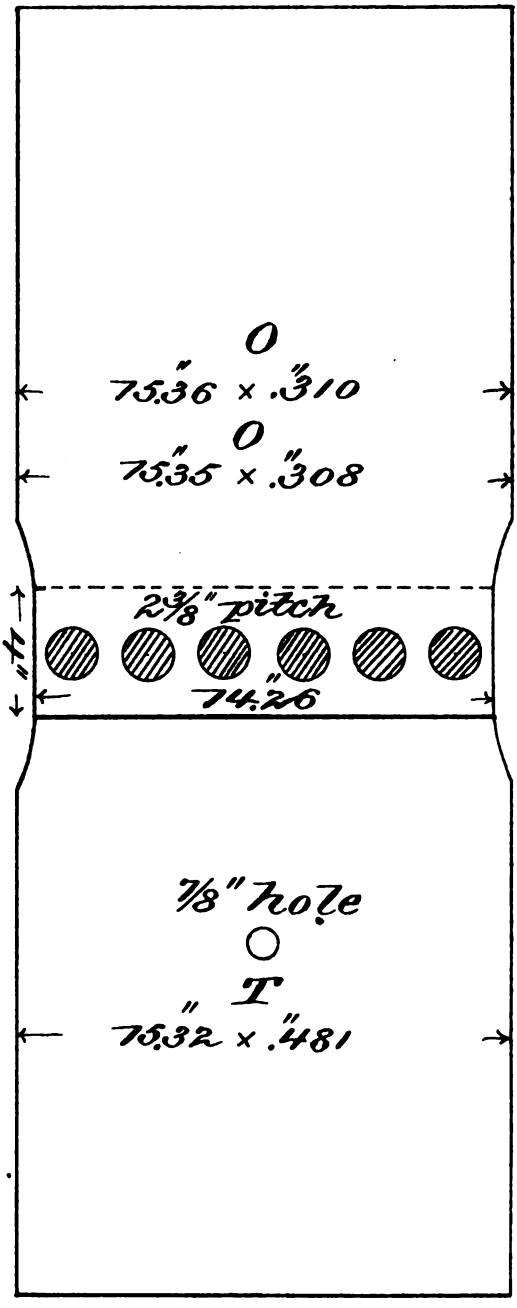
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	46,610
Tension on net section of plate	do....	76,220
Compression on bearing surface of rivets	do....	119,980
Shearing on rivets	do....	42,060

Efficiency of joint, 77.6 per cent.

No. 7410

½" steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches	6.859
Plate, net sectional area	do	4.87½
Plate, bearing surface of rivets	do	2.525
Rivets, shearing area	do	7.216

[Tested at temperature of 350° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
310,700	45,300	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ″.16 each.

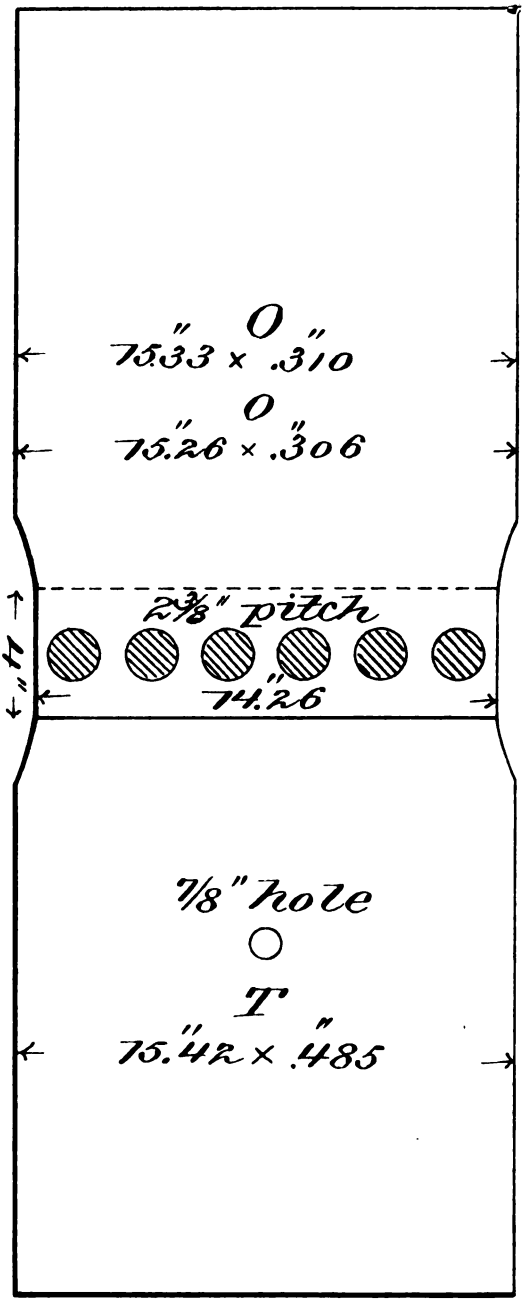
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	45,300
Tension on net section of plate	do	71,690
Compression on bearing surface of rivets	do	123,050
Shearing on rivets	do	43,060

Efficiency of joint, 75.5 per cent.

No. 7411.

½" Steel plate



H Ex 31 49 2

Areas.

sectional area	square inches	6.916
ctional area	do	4.370
ıg surface of rivets	do	2,546
ring area	do	7,216

ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0003	.....	
3,000	.0008	.....	
4,000	.0011	.....	
5,000	.0022	.0012	
6,000	.0038	.....	
7,000	.0046	.....	
8,000	.0055	.....	
9,000	.0064	.....	
10,000	.0088	.0066	
11,000	.0102	.....	
12,000	.0113	.....	
13,000	.0123	.....	
14,000	.0133	.....	
15,000	.0140	.0101	
16,000	.0152	.....	
17,000	.0161	.....	
18,000	.0177	.....	
19,000	.0192	.....	
20,000	.0207	.0143	
21,000	.0232	.....	
22,000	.0251	.....	
23,000	.0275	.....	
24,000	.0319	.....	
25,000	.0395	.0306	
26,000	.0499	.....	
27,000	.0594	.....	
28,000	.0699	.....	
29,000	.0810	.....	
30,000	.0960	.....	
31,000	.1100	.....	
32,000	.15	.....	
33,000	.17	.....	
34,000	.19	.....	
35,000	.20	.....	
36,000	.24	.....	
37,000	.28	.....	
38,000	.34	.....	
39,000	.39	.....	
40,000	.49	.....	
40,050	.....	.....	Tensile strength.

ed the rivets.
ge elongation of rivet-holes ″.25.
verse diameter of rivet-holes increased ″.03.

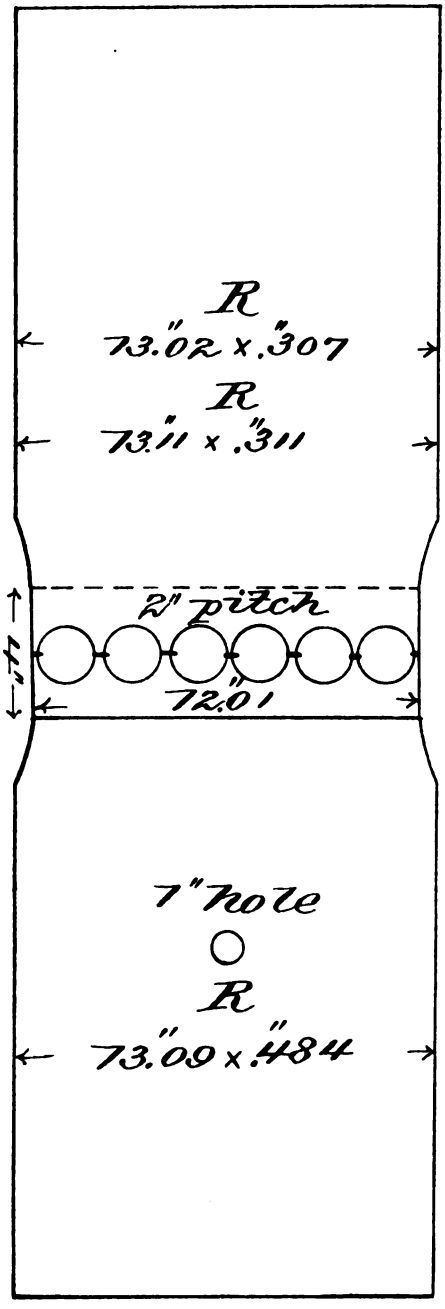
Maximum stress on joint.

gross section of plate	pounds per square inch	40,050
net section of plate	do	63,390
ı on bearing surface of rivets	do	108,800
rivets	do	38,530

of joint, 66.7 per cent.

No. 1412

½" steel plate



H Ex 31 49 2

Areas.

gross sectional area	square inches	5.813
net sectional area	do	2.909
bearing surface of rivets	do	2.904
, shearing area	do	9.425

[Tested at temperature of 250° Fahr.]

Applied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
, 800	35, 920	.....	.....	Tensile strength.

ractured plate along line of riveting.
ppearance, silky, stratified. Middle section open ″.05.
rea at fracture (one section), ″.89×″.35=.3115 square inch.
ontraction, 35.6 per cent.
Elongation of rivet-holes, ″.32, ″.31, ″.30, ″.31, ″.32, ″.33.

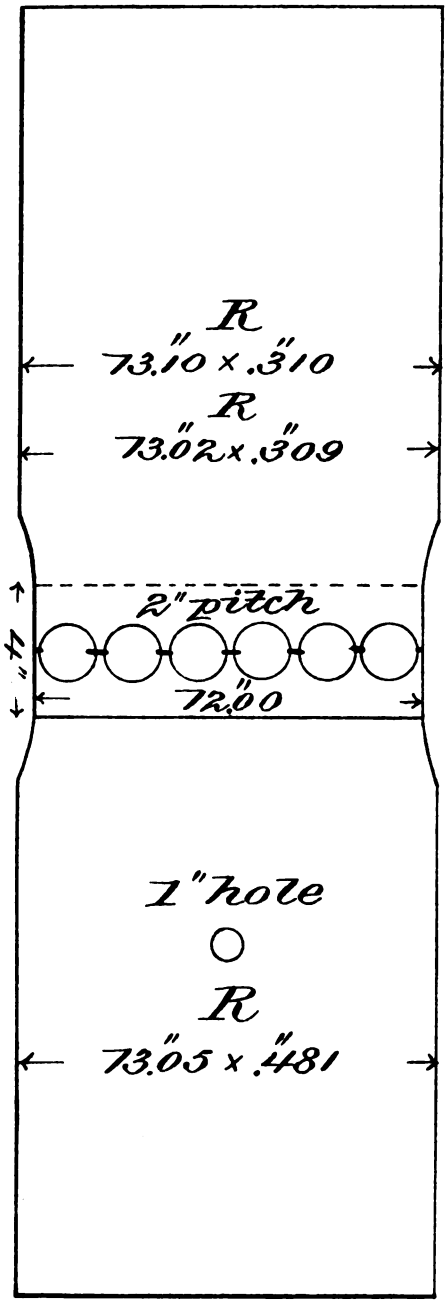
Maximum stress on joint.

sion on gross section of plate	pounds per square inch	35, 920
sion on net section of plate	do	71, 770
mpression on bearing surface of rivets	do	71, 900
earing on rivets	do	22, 150

Efficiency of joint, 62.8 per cent.

No. 1413

½" steel plate



H Ex 31 49 2

Areas.

sectional area	square inches..	5.772
ctional area	do....	2.886
ng surface of rivets	do....	2.886
ring area	do....	9.425

ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0002	.....	
3,000	.0005	.....	
4,000	.0008	.....	
5,000	.0011	.0006	
6,000	.0021	.....	
7,000	.0039	.....	
8,000	.0052	.....	
9,000	.0061	.....	
10,000	.0068	.0055	
11,000	.0082	.....	
12,000	.0091	.....	
13,000	.0099	.....	
14,000	.0108	.....	
15,000	.0118	.0093	
16,000	.0130	.....	
17,000	.0141	.....	
18,000	.0153	.....	
19,000	.0169	.....	
20,000	.0184	.0143	
21,000	.0204	.....	
22,000	.0227	.....	
23,000	.0260	.....	
24,000	.0294	.....	
25,000	.0344	.0276	
26,000	.0436	.....	
27,000	.0535	.....	
28,000	.0635	.....	
29,000	.0751	.....	
30,000	.0900	.0800	
31,000	.11	.....	
32,000	.14	.....	
33,000	.17	.....	
34,000	.23	.....	
34,390	.....	.....	Tensile strength.

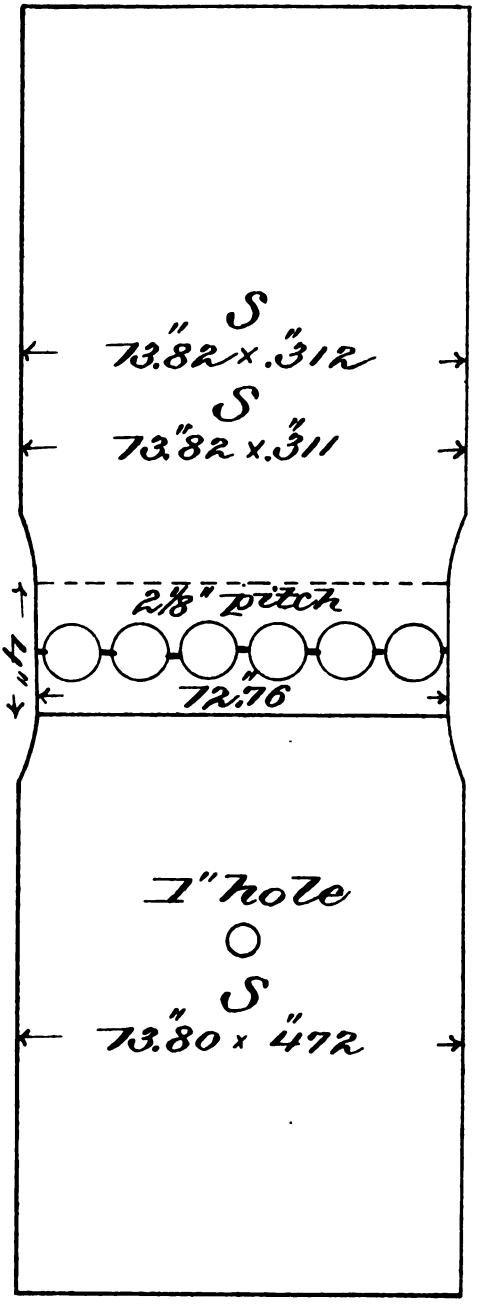
ired plate across line of riveting.
rance, silky. Open at edges ″.05 and ″.03.
ation of rivet-holes, ″.48, ″.47, ″.45, ″.44, ″.43, ″.40.
t fracture (one section), ″.82×″.28=.2296 square inch.
action, 52.2 per cent.

Maximum stress on joint.

gross section of plate	pounds per square inch..	34.390
net section of plate	do....	68.780
on bearing surface of rivets	do....	68.780
rivets	do....	21.060

of joint, 60.1 per cent.

No. 7474



1/2" steel plate

H Ex 31 49 2

Areas.

, gross sectional area	square inches	6.023
, net sectional area	do	3.191
, bearing surface of rivets	do	2.832
s, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
unds.	*Pounds.*	*Inch.*	*Inch.*	
5,023	1,000	0.	0.	Initial load.
2,046	2,000	—.0001	.....	
3,069	3,000	—.0004	.....	
4,092	4,000	—.0003	.....	
1,115	5,000	+.0002	.0001	
6,138	6,000	.0021	.....	
7,161	7,000	.0030	.....	
8,184	8,000	.0036	.....	
.207	9,000	.0046	.....	
10,230	10,000	.0057	.0051	
11,253	11,000	.0066	.....	
12,276	12,000	.0074	.....	
,299	13,000	.0086	.....	
,322	14,000	.0097	.....	
.345	15,000	.0108	.0091	
,368	16,000	.0124	.....	
,391	17,000	.0131	.....	
,414	18,000	.0139	.....	
,437	19,000	.0151	.....	
,460	20,000	.0172	.0136	
,483	21,000	.0201	.....	
,506	22,000	.0229	.....	
,529	23,000	.0275	.....	
,552	24,000	.0341	.....	
,575	25,000	.0411	.0356	
,598	26,000	.0496	.....	
,621	27,000	.0561	.....	
,644	28,000	.0676	.....	
,667	29,000	.0805	.....	
.690	30,000	.0981	.0890	
,713	31,000	.12	.....	
,736	32,000	.16	.....	
,757	33,000	.19	.....	
,782	34,000	.23	.....	
,805	35,000	.3$_4$	.....	Tensile strength.

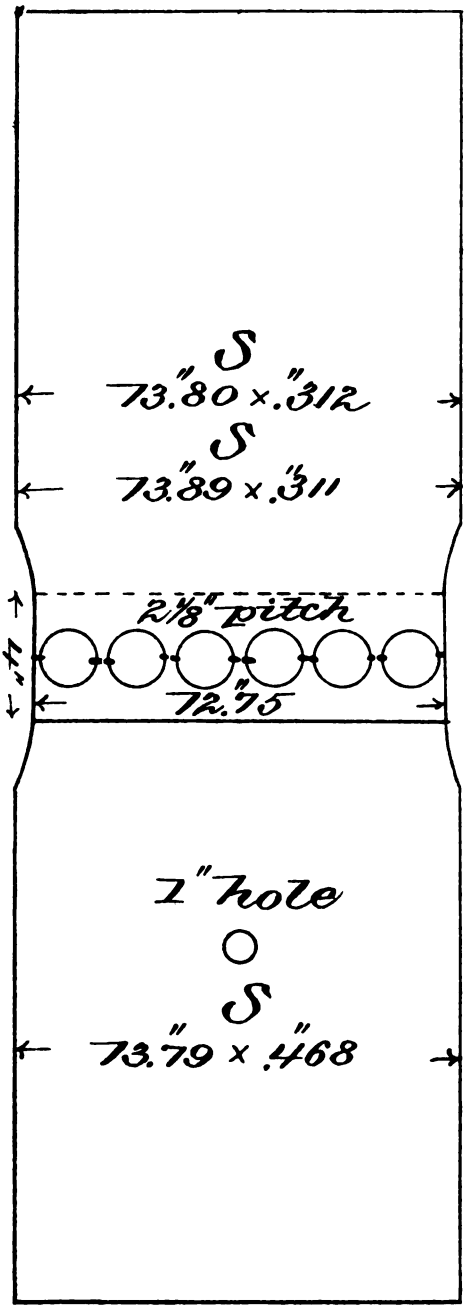
actured plate along line of riveting.
ppearance, silky, slightly lamellar. Open at edges ″.10 and ″.03.
ongation of rivet-holes, ″.49, ″.45, ″.43, ″.43, ″.46, ″.48.
rea at fracture (one section), ″.94 × ″.30 = .282 square inch.
ontraction, 46.8 per cent.

Maximum stress on joint.

on on gross section of plate	pounds per square inch	35,000
n on net section of plate	do	66,020
ession on bearing surface of rivets	do	74,430
ng on rivets	do	22,360

dency of joint, 59.2 per cent.

No. 7475



7/2" steel plate

H Ex 31 492

Areas.

Plate, gross sectional area	square inches	5.967
Plate, net sectional area	do	3.159
Plate, bearing surface of rivets	do	2.808
Shearing area of rivets	do	9.425

[Tested at temperature of 300° Fahr.]

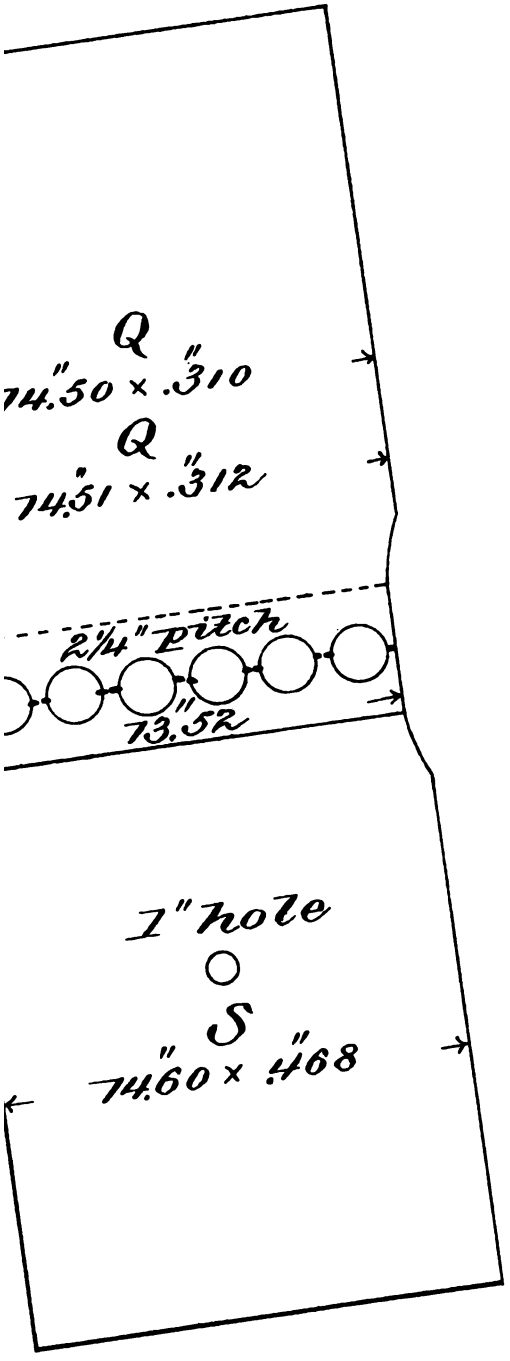
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
240,200	40,250	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.03 and ″.01.
Area at fracture (one section), 1″.02×″.35=.3570 square inch.
Contraction, 32.1 per cent.
Elongation of rivet-holes, ″.29, ″.27, ″.26, ″.28, ″.30, ″.31.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	40,250
Tension on net section of plate	do	76,010
Compression on bearing surface of rivets	do	85,540
Shearing on rivets	do	25,480

Efficiency of joint, 68.1 per cent.


Q
74.50 × .310
Q
74.51 × .312
2¼" pitch
73.52
1" hole
S
74.60 × .468

No. 1 Plate
½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.327
Plate, net sectional area	do....	3.519
Plate, bearing surface of rivets	do....	2.808
Rivets, shearing area	do....	9.425

[Tested at temperature of 200° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
219,300	34,660	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, very lamellar. Open at edges, ″.10 and ″.05.
Area at fracture (one section), 1″.07 × ″.30 = .3210 square inch.
Contraction, 45.1 per cent.
Elongation of rivet-holes, ″.47, ″.44, ″.42, ″.41, ″.44, ″.47.

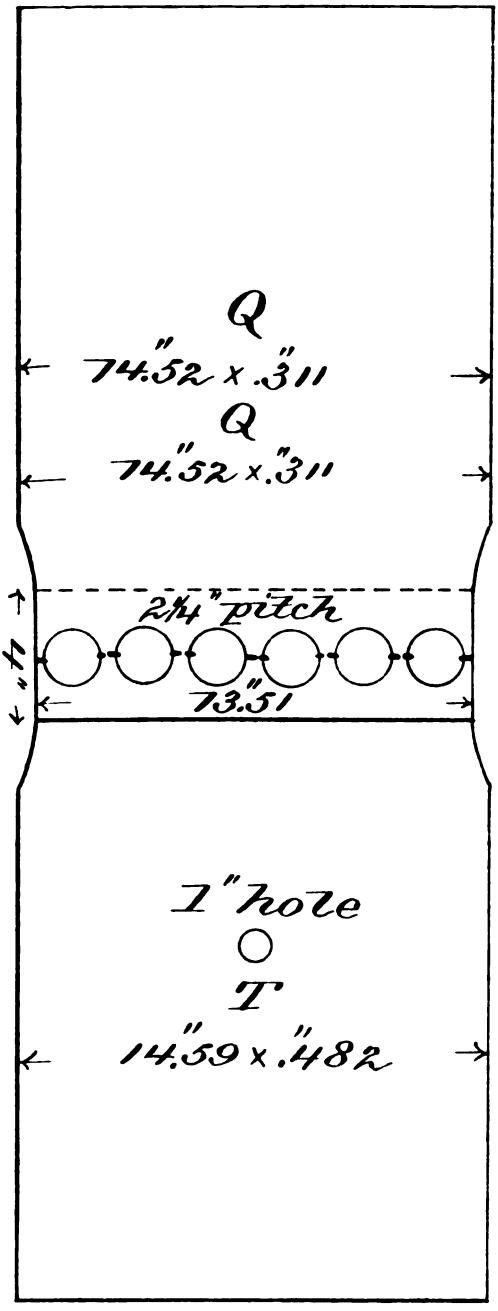
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,660
Tension on net section of plate	do....	62,320
Compression on bearing surface of rivets	do....	78,090
Shearing on rivets	do....	23,160

Efficiency of joint, 60.3 per cent

No. 7417

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.512
Plate, net sectional area	do	3.620
Plate, bearing surface of rivets	do	2.892
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,512	1,000	0.	0.	Initial load.
13,024	2,000	.0001	.....	
19,536	3,000	.0015	.....	
26,048	4,000	.0020	.....	
32,560	5,000	.0022	.0019	
39,072	6,000	.0027	.....	
45,584	7,000	.0046	.....	
52,096	8,000	.0059	.....	
58,608	9,000	.0066	.....	
65,120	10,000	.0074	.0064	
71,632	11,000	.0083	.....	
78,144	12,000	.0088	.....	
84,656	13,000	.0095	.....	
91,168	14,000	.0104	.....	
97,680	15,000	.0119	.0094	
104,192	16,000	.0137	.....	
110,704	17,000	.0148	.....	
117,216	18,000	.0153	.....	
123,728	19,000	.0161	.....	
130,240	20,000	.0177	.0137	
136,752	21,000	.0201	.....	
143,264	22,000	.0229	.....	
149,776	23,000	.0261	.....	
156,288	24,000	.0298	.....	
162,800	25,000	.0380	.0308	
169,312	26,000	.0460	.....	
175,824	27,000	.0540	.....	
182,336	28,000	.0609	.....	
188,848	29,000	.0752	.....	
195,360	30,000	.0942	.0842	
201,872	31,000	.11	.....	
208,384	32,000	.14	.....	
214,896	33,000	.17	.....	
221,408	34,000	.20	.....	
227,920	35,000	.23	.....	
234,432	36,000	.28	.....	
240,680	36,950	.38	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.15 and ″.10.
Area at fracture (one section), 1″.06×″.29=.3074 square inch.
Contraction, 48.9 per cent.
Elongation of rivet-holes, ″.55, ″.52, ″.48, ″.48, ″.48, ″.50.

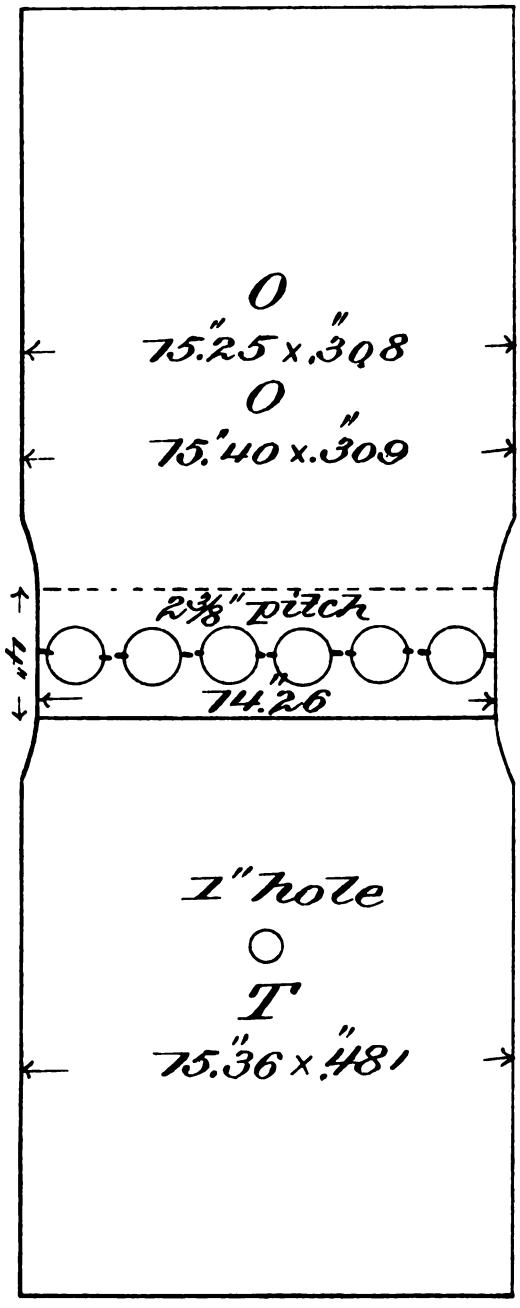
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,950
Tension on net section of plate	do	66,480
Compression on bearing surface of rivets	do	82,220
Shearing on rivets	do	25,530

Efficiency of joint, 61.5 per cent.

No. 7418

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.859
Plate, net sectional area	do	3.973
Plate, bearing surface of rivets	do	2.886
Rivets, shearing area	do	9.425

[Heated to temperature of 400° Fahr., and loaded with 280,000 pounds tension; after one-half minute the load was released to zero, and the joint cooled to a temperature between 70° and 80° Fahr. Water was sprinkled on the joint to hasten cooling. Permanent set of joint, ".20. Tested cold (about 80° Fahr.) after resting two hours.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,859	1,000	0.	0.	Initial load.
13,718	2,000	.0016	.....	
20,577	3,000	.0042	.....	
27,436	4,000	.0051	.....	
34,295	5,000	.0060	.0030	
41,154	6,000	.0065	.....	
48,012	7,000	.0070	.....	
54,872	8,000	.0074	.....	
61,731	9,000	.0079	.....	
68,590	10,000	.0084	.0027	
75,449	11,000	.0084	.....	
82,308	12,000	.0091	.....	
89,167	13,000	.0095	.....	
96,026	14,000	.0100	.....	
102,885	15,000	.0103	.0027	
109,744	16,000	.0105	.....	
116,603	17,000	.0109	.....	
123,462	18,000	.0112	.....	
130,321	19,000	.0114	.....	
137,180	20,000	.0117	.0025	
144,039	21,000	.0122	.....	
150,898	22,000	.0126	.....	
157,757	23,000	.0129	.....	
164,616	24,000	.0132	.....	
171,475	25,000	.0135	.0027	
178,334	26,000	.0142	.....	
185,193	27,000	.0147	.....	
192,052	28,000	.0152	.....	
198,911	29,000	.0153	.....	
205,770	30,000	.0157	.0029	
212,629	31,000	.0160	.....	
219,488	32,000	.0168	.....	
226,347	33,000	.0172	.....	
233,206	34,000	.0173	.....	
240,065	35,000	.0177	.0027	
246,924	36,000	.0178	.....	
253,783	37,000	.0183	.....	
260,642	38,000	.0189	.....	
267,501	39,000	.0195	.....	
274,360	40,000	.0200	.0053	
281,219	41,000	.0225	.....	
		.0237	.....	After 2 minutes rest.
283,000	.....	.0241	.....	
285,000	.....	.0246	.....	
287,000	.....	.0261	.....	
288,078	42,000	.0307	.....	
		.0400	.....	After 2 minutes rest.
299,800	43,710	.18	.....	Tensile strength.

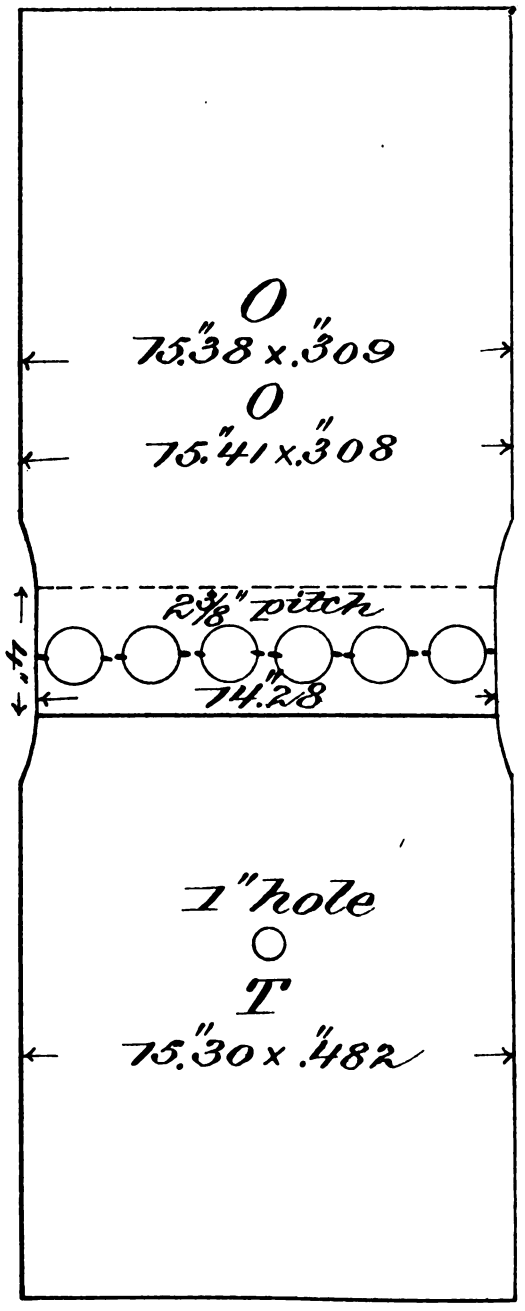
Total elongation from cold state before heating (".20+".18) ".38±.
Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ".07 each.
Area at fracture (one section), 1".22×".32=.3904 square inch.
Contraction, 40.9 per cent.
Elongation of rivet-holes, ".51, ".46, ".44, ".44, ".44, ".45.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	43,710
Tension on net section of plate	do	75,460
Compression on bearing surface of rivets	do	103,880
Shearing on rivets	do	31,810

Efficiency of joint, 72.8 per cent.

No. 7419



H Ex 31 49 2

Areas.

ıs sectional area	square inches..	6.883
sectional area	do....	3.991
ring surface of rivets	do....	2.892
earing area	do....	9.425

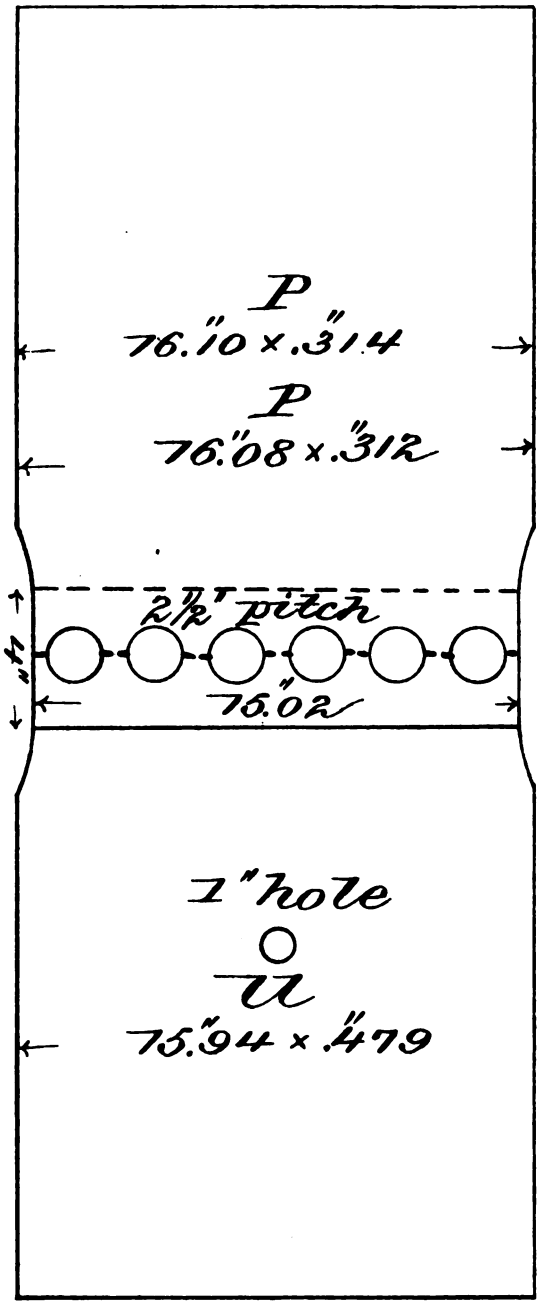
plied loads.		In gauged lengths.		Remarks.
.	Per square inch.	Elongation.	Set.	
s.	*Pounds.*	*Inch.*	*Inch.*	
3	1,000	0.	0.	Initial load.
3	2,000	0.	.....	
9	3,000	.0001	.....	
2	4,000	.0002	.....	
5	5,000	.0006	.0002	
3	6,000	.0019	.....	
1	7,000	.0029	.....	
4	8,000	.0039	.....	
7	9,000	.0050	.....	
0	10,000	.0066	.0053	
8	11,000	.0078	.....	
5	12,000	.0089	.....	
9	13,000	.0100	.....	
2	14,000	.0108	.....	
5	15,000	.0117	.0089	
3	16,000	.0130	.....	
1	17,000	.0137	.....	
4	18,000	.0146	.....	
7	19,000	.0157	.....	
0	20,000	.0170	.0136	
4	21,000	.0188	.....	
5	22,000	.0200	.....	
9	23,000	.0212	.....	
2	24,000	.0232	.....	
5	25,000	.0272	.0199	
8	26,000	.0355	.....	
1	27,000	.0475	.....	
4	28,000	.0630	.....	
7	29,000	.0775	.....	
0	30,000	.0950	.0845	
4	31,000	.11	.....	
5	32,000	.13	.....	
9	33,000	.16	.....	
2	34,000	.18	.....	
5	35,000	.21	.....	
8	36,000	.25	.....	
1	37,000	.30	.....	
4	38,000	.37	.....	
0	38,720	.47	.....	Tensile strength.

tured plate along line of riveting.
earance, silky, slight lamination. Open at edges ″.13 and ″.05.
gation of rivet-holes, ″.57, ″.54, ″.53, ″.54, ″.55, ″.60.
at fracture (one section), 1″.20×″.29=.3480 square inch.
raction, 38.1 per cent.

Maximum stress on joint.

n gross section of plate	pounds per square inch..	38,720
n net section of plate	do....	66,770
ion on bearing surface of rivets	do....	92,150
n rivets	do....	28,270

y of joint, 64.5 per cent.



½" steel plate

H Ex 31 492

Areas.

s sectional area	square inches..	7.194
sectional area	do....	4.320
ing surface of rivets	do....	2.874
aring area	do....	9.425

) temperature of 500° Fahr. and loaded with 300,000 pounds tension, which was at once . The joint now allowed to cool to the temperature of the room (72° Fahr.), and after a rest ours tested cold in the usual manner. Permanent set caused by load when hot, ".27 in 5

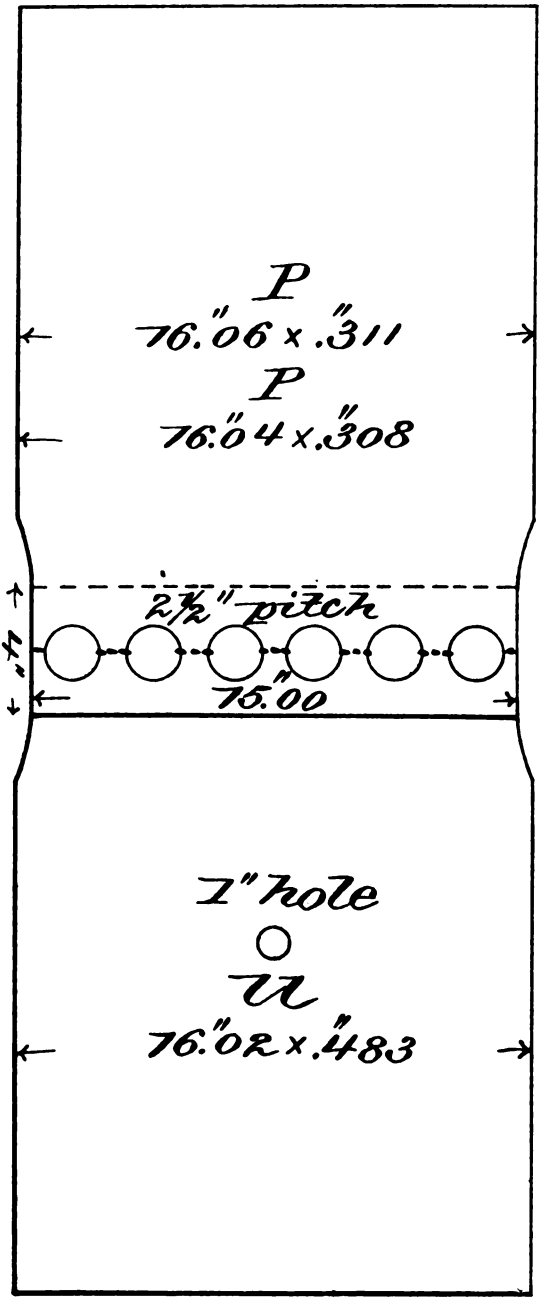
lied loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0008	.....	
3,000	.0019	.....	
4,000	.0027	.....	
5,000	.0030	.0009	
6,000	.0037	.....	
7,000	.0046	.....	
8,000	.0050	.....	
9,000	.0054	.....	
10,000	.0056	.0011	
11,000	.0061	.....	
12,000	.0065	.....	
13,000	.0070	.....	
14,000	.0072	.....	
15,000	.0076	.0010	
16,000	.0080	.....	
17,000	.0084	.....	
18,000	.0090	.....	
19,000	.0093	.....	
20,000	.0095	.0010	
21,000	.0100	.....	
22,000	.0105	.....	
23,000	.0109	.....	
24,000	.0111	.....	
25,000	.0115	.0010	
26,000	.0122	.....	
27,000	.0125	.....	
28,000	.0130	.....	
29,000	.0132	.....	
30,000	.0136	.0014	
31,000	.0141	.....	
32,000	.0145	.....	
33,000	.0150	.....	
34,000	.0155	.....	
35,000	.0161	.0015	
36,000	.0163	.....	
37,000	.0169	.....	
38,000	.0175	.....	
39,000	.0183	.....	
40,000	.0198	.0045	
41,000	.0215	.....	
42,000	.0245	.....	
43,000	.0340	.....	
44,000	.1150	.....	
44,840	.27	.....	Tensile strength.

elongation from cold state before heating (".27+.27), ".54.
ured plate along line of riveting.
arance, silky, slight lamination. Open at edges ".08 and ".06.
at fracture (one section), 1".31×".33=.4323 square inch.
action, 39.8 per cent.
ation of rivet-holes, ".60, ".54, ".53, ".53, ".52, ".55.

Maximum stress on joint.

gross section of plate	pounds per square inches..	44,840
net section of plate	do....	74,670
n on bearing surface of rivets	do....	112,250
rivets	do....	34,230

of joint, 77.3 per cent.



H Ex 31 492

Areas.

Plate, gross sectional area	square inches	7.245
Plate, net sectional area	do	4.347
Plate, bearing surface of rivets	do	2.898
Rivets, shearing area	do	9.425

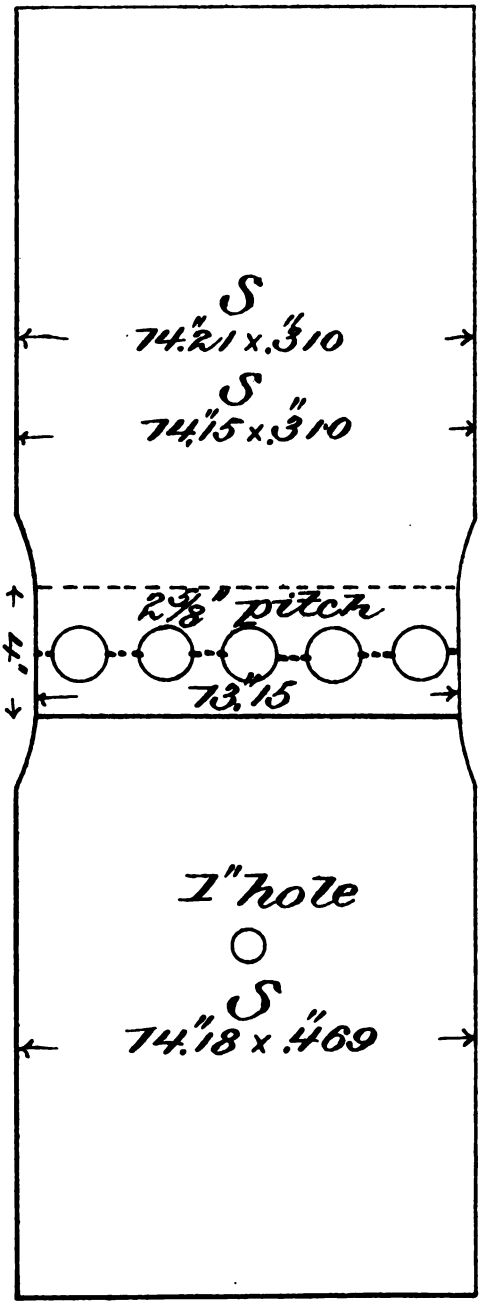
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,245	1,000	0.	0.	Initial load.
14,490	2,000	.0001	.....	
21,735	3,000	.0002	.....	
28,980	4,000	.0003	.....	
36,225	5,000	.0018	.0017	
43,470	6,000	.0039	.....	
50,715	7,000	.0052	.....	
57,960	8,000	.0066	.....	
65,205	9,000	.0073	.....	
72,450	10,000	.0085	.0077	
79,695	11,000	.0095	.....	
86,940	12,000	.0106	.....	
94,185	13,000	.0120	.....	
101,430	14,000	.0141	.....	
108,675	15,000	.0143	.0122	
115,920	16,000	.0155	.....	
123,165	17,000	.0168	.....	
130,410	18,000	.0179	.....	
137,655	19,000	.0187	.....	
144,900	20,000	.0202	.0167	
152,145	21,000	.0221	.....	
159,390	22,000	.0236	.....	
166,635	23,000	.0254	.....	
173,880	24,000	.0308	.....	
181,125	25,000	.0400	.0332	Rested 1 hour under initial load.
188,370	26,000	.0538	.....	
195,615	27,000	.0668	.....	
202,860	28,000	.0798	.....	
210,105	29,000	.0980	.....	
217,350	30,000	.1145	.1030	
224,595	31,000	.13	.....	
231,840	32,000	.16	.....	
239,085	33,000	.18	.....	
246,330	24,000	.22	.....	
253,575	35,000	.27	.....	
260,820	36,000	.30	.....	
268,065	37,000	.35	.....	
275,310	38,000	.42	.....	
286,700	38,740	.53	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ″.25 and ″.05.
Elongation of rivet-holes, ″.79, ″.70, ″.66, ″.59, ″.61, ″.63.
Area at fracture (one section), 1″.30×″.29=.3770 square inch.
Contraction, 47.9 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,740
Tension on net section of plate	do	64,570
Compression on bearing surface of rivets	do	96,850
Shearing on rivets	do	29,780

Efficiency of joint, 66.9 per cent.



H Ex 31 492

Areas.

sectional area	square inches..	6.167
ctional area	do....	3.822
g surface of rivets	do....	2.345
ring area	do....	7.854

ed loads.	In ganged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	—.0001	.....	
3,000	—.0001	.....	
4,000	.0000	.....	
5,000	.0000	.0000	
6,000	.0003	.....	
7,000	.0060	.....	
8,000	.0072	.....	
9,000	.0081	.....	
10,000	.0091	.0086	
11,000	.0099	.....	
12,000	.0103	.....	
13,000	.0110	.....	
14,000	.0118	.....	
15,000	.0130	.0117	
16,000	.0147	.....	
17,000	.0161	.....	
18,000	.0175	.....	
19,000	.0185	.....	
20,000	.0195	.0170	
21,000	.0210	.....	
22,000	.0225	.....	
23,000	.0248	.....	
24,000	.0284	.....	
25,000	.0375	.0322	
26,000	.0519	.....	
27,000	.0640	.....	
28,000	.0789	.....	
29,000	.0951	.....	
30,000	.1149	.1048	
31,000	.125	.....	
32,000	.16	.....	
33,000	.19	.....	
34,000	.22	.....	
35,000	.26	.....	
36,000	.29	.....	
37,000	.33	.....	
38,000	.40	.....	
39,000	.48	.....	
39,730	.61	.....	Tensile strength.

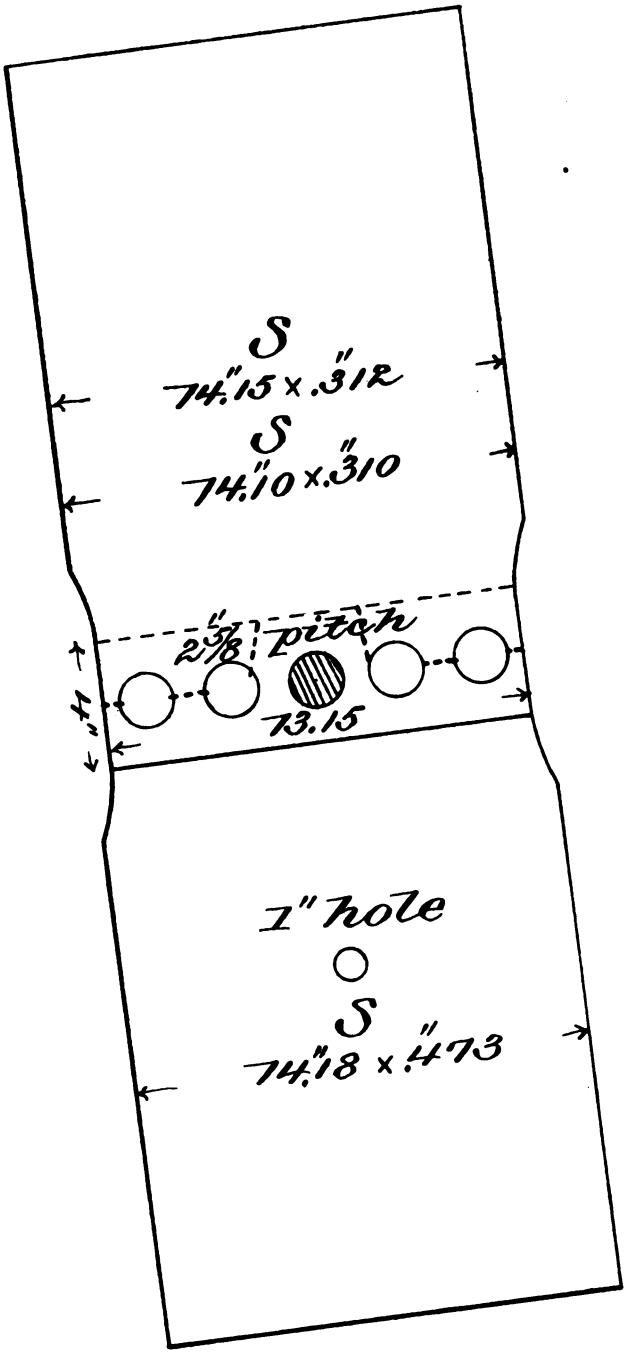
ired plate along line of riveting.
rance, silky, lamellar. Open at edges ″.17 and ″.25.
ation of rivet-holes, ″.73, ″.70, ″.77, ″.77, ″.76.
at fracture (one section), 1″.42×″.30=.4260 square inch.
action, 44.1 per cent.

Maximum stress on joint.

gross section of plate	pounds per square inch..	39,730
net section of plate	do....	64,110
on bearing surface of rivets	do....	104,490
rivets	do....	31,200

of joint, 67.2 per cent.

No. 7423



1/2" steel plate

H Ex 31 492

Areas.

gross sectional area	square inches	6.220
net sectional area	do	3.855
bearing surface of rivets	do	2.365
shearing area	do	7.854

[Tested at temperature of 400° Fahr.]

Applied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
500	45,420	.....	.....	Tensile strength.

actured the plate through four sections, tearing out at the middle e edge of the plate. Sheared the middle rivet, which had been ened by the drilled pocket in which the thermometer was used to mine the temperature of the joint.

pearance of fractures, silky, lamellar.

ngation of rivet-holes, ″.40, ″.36 (″.18 rivet sheared in this hole), ″.53.

ea at fracture (one section), 1″.53×″.38=.5814 square inch.

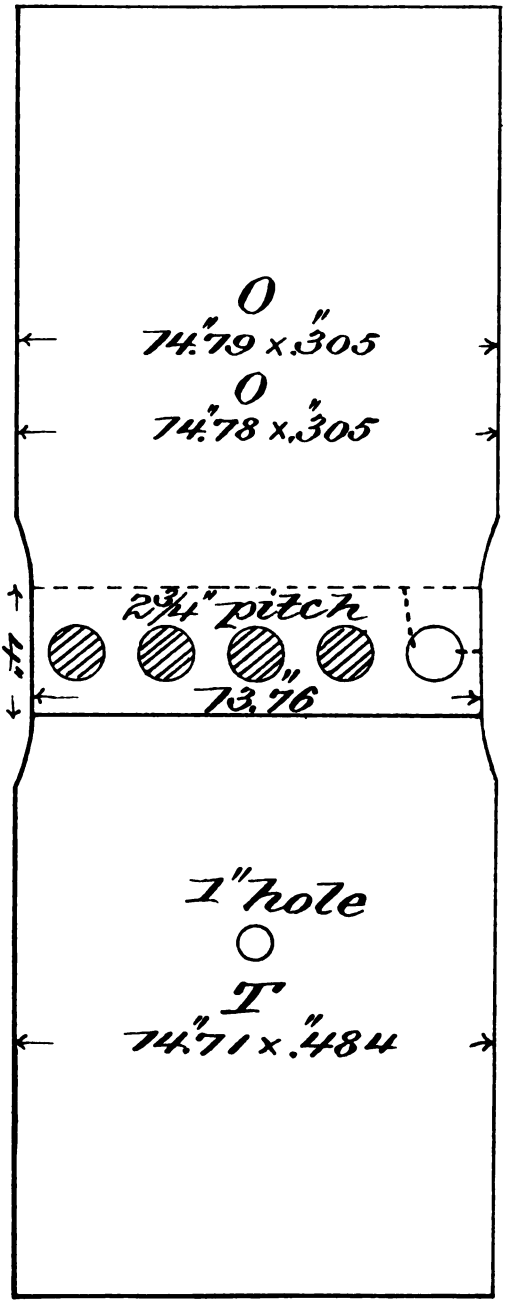
ntraction, 24.3 per cent.

Maximum stress on joint.

n on gross section of plate	pounds per square inch	45,420
n on net section of plate	do	73,250
ession on bearing surface of rivets	do	119,450
g on rivets	do	35,840

ency of joint, 76.9 per cent.

No. 74324



7/8" steel plate

H Ex 31 49 2

Areas.

ross sectional area	square inches	6.660
et sectional area	do	4.240
earing surface of rivets	do	2.420
shearing area	do	7.854

[Tested at temperature of 500° Fahr.]

Applied loads.		In ganged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
000	46,550	.....	.....	Maximum load applied when the specimen slipped in the holder jaws. The emery cloth used to increase the friction of the grip was renewed. The temperature of the joint was lowered to 150° Fahr. and tensile load again applied.
000	48,950	.....	.....	Tensile strength.

eared four rivets and fractured one end section of the plate.
ongation of rivet-holes, ″.30, ″.30, ″.25, ″.37.
e dowel in third rivet did not fill the hole properly, accounting for variation in the elongation of rivet-holes.

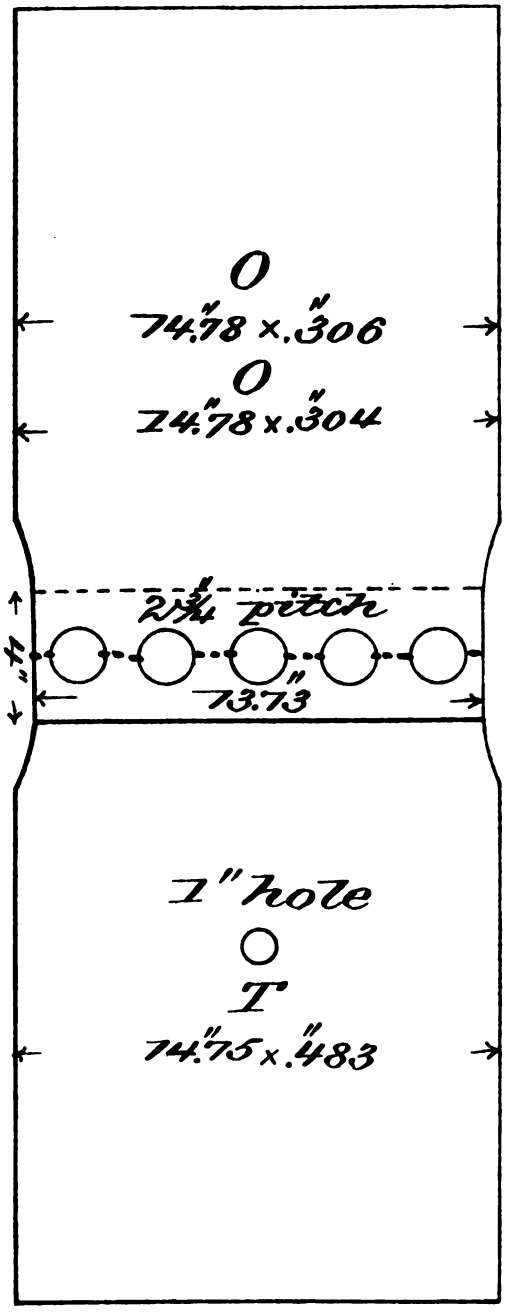
Maximum stress on joint.

n on gross section of plate	pounds per square inch	48,950
n on net section of plate	do	76,890
sion on bearing surface of rivets	do	137,160
g on rivets	do	41,510

ncy of joint, 81.5 per cent.

No. 7425

½" steel plate



H Ex 31 49 2

Areas.

sectional area	square inches..	6.632
ctional area	do....	4.217
ıg surface of rivets	do....	2.415
ring area	do....	7.854

ed loads.	In ganged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0000	.....	
3,000	.0001	.....	
4,000	.0003	.....	
5,000	.0002	.0002	
6,000	.0001	.....	
7,000	.0021	.....	
8,000	.0040	.....	
9,000	.0047	.....	
10,000	.0062	.0056	
11,000	.0070	.....	
12,000	.0074	.....	
13,000	.0080	.....	
14,000	.0091	.....	
15,000	.0109	.0101	
16,000	.0127	.....	
17,000	.0136	.....	
18,000	.0148	.....	
19,000	.0161	.....	
20,000	.0176	.0147	
21,000	.0198	.....	
22,000	.0216	.....	
23,000	.0247	.....	
24,000	.0291	.....	
25,000	.0465	.0396	
26,000	.0638	.....	
27,000	.0781	.....	
28,000	.0948	.....	
29,000	.1135	.....	
30,000	.15	.....	
31,000	.18	.....	
32,000	.20	.....	
33,000	.21	.....	
34,000	.27	.....	
35,000	.30	.....	
36,000	.34	.....	
37,000	.41	.....	
38,000	.48	.....	
39,000	.56	.....	
40,000	.65	.....	
40,600	.77	.....	Tensile strength.

ured plate along line of riveting.
ırance, silky, lamellar. Open at edges ″.12 and ″.15.
ation of rivet-holes, ″.84, ″.84, ″.79, ″.75, ″.78.
at fracture (one section), 1″.55×″.29=.4495 square inch.
action, 46.8 per cent.

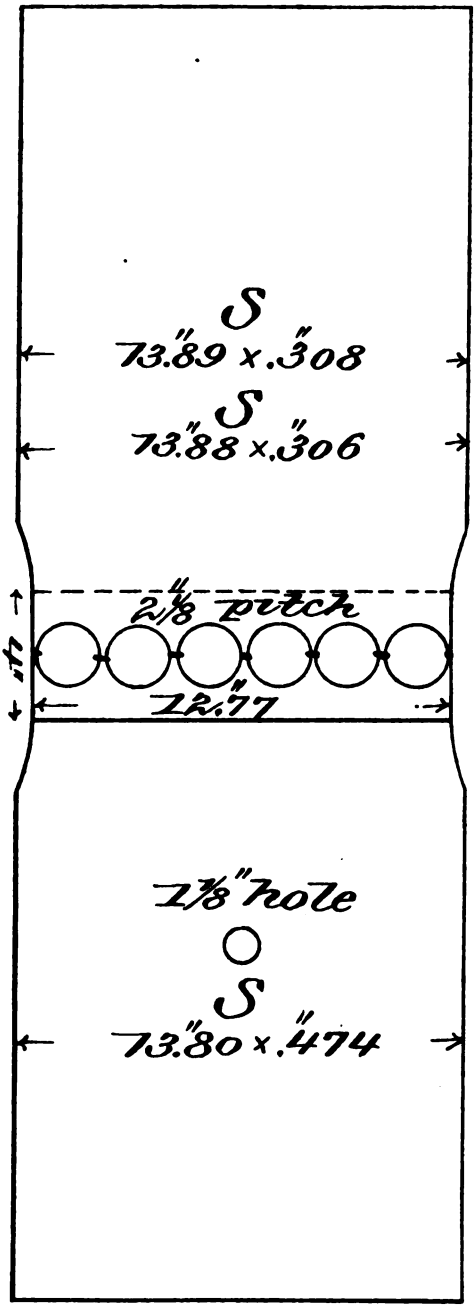
Maximum stress on joint.

gross section of plate	pounds per square inch..	40,600
net section of plate	do....	63,860
n on bearing surface of rivets	do....	111,490
ı rivets	do....	34,280

' of joint, 67.6 per cent.

No. 7426

½" steel plate.



H Ex 31 492

Areas.

Plate, gross sectional area	square inches	6.053
Plate, net sectional area	do	2.853
Plate, bearing surface of rivets	do	3.200
Rivets, shearing area	do	11.928

[Tested at temperature of 300° Fahr.]

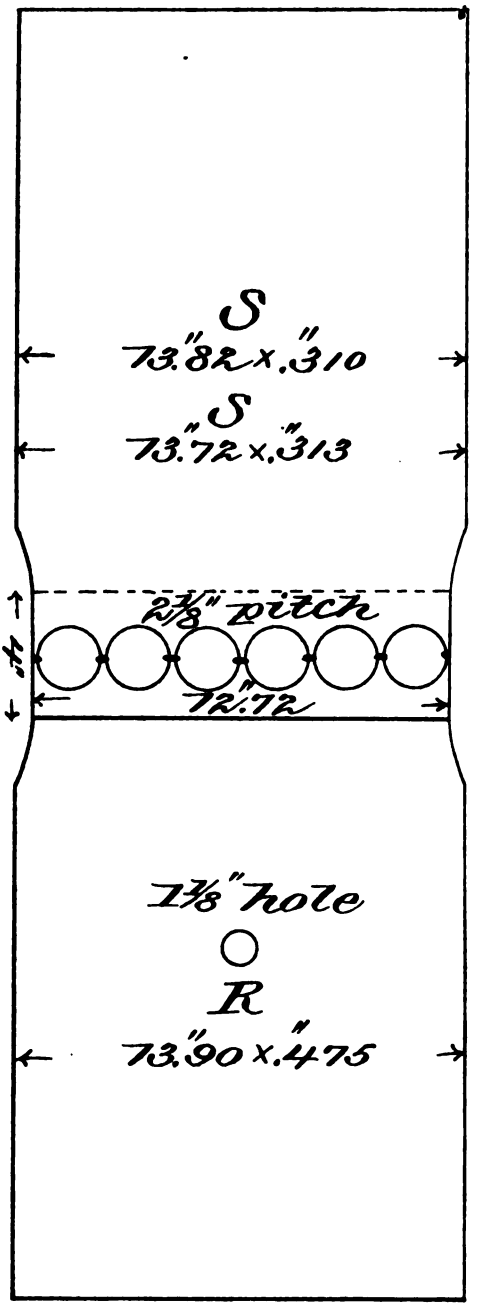
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
212,300	35,070	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar.
Area at fracture (one section), ″.89×″.34=.3026 square inch.
Contraction, 36.1 per cent.
Elongation of rivet-holes, ″.28, ″.28, ″.28, ″.29, ″.29, ″.29.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	35,070
Tension on net section of plate	do	74,410
Compression on bearing surface of rivets	do	66,340
Shearing on rivets	do	18,630

Efficiency of joint, 50.3 per cent.



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.042
Plate, net sectional area	do	2.836
Plate, bearing surface of rivets	do	3.206
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,042	1,000	0.	0.	Initial load.
12,084	2,000	.0000	.....	
18,126	3,000	.0001	.....	
24,168	4,000	.0003	.....	
30,210	5,000	.0006	.0004	
36,252	6,000	.0013	.....	
42,294	7,000	.0032	.....	
48,336	8,000	.0042	.....	
54,378	9,000	.0053	.....	
60,420	10,000	.0065	.0057	
66,462	11,000	.0086	.....	
72,504	12,000	.0102	.....	
78,546	13,000	.0114	.....	
84,588	14,000	.0126	.....	
90,630	15,000	.0135	.0112	
96,672	16,000	.0150	.....	
102,714	17,000	.0163	.....	
108,756	18,000	.0179	.....	
114,798	19,000	.0201	.....	
120,840	20,000	.0247	.0200	
126,882	21,000	.0282	.....	
132,924	22,000	.0316	.....	
138,966	23,000	.0102	.....	
145,008	24,000	.0485	.....	
151,050	25,000	.0596	.0517	
157,092	26,000	.0732	.....	
163,134	27,000	.0865	.....	
169,176	28,000	.1050	.....	
175,218	29,000	.14	.....	
181,260	30,000	.18	.....	
183,800	30,420	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ".10 and ".08.
Elongation of rivet-holes, ".41, ".42, ".42, ".42, ".42, ".42.
Area at fracture (one section), ".83×".29=.2407 square inch.
Contraction, 49.3 per cent.

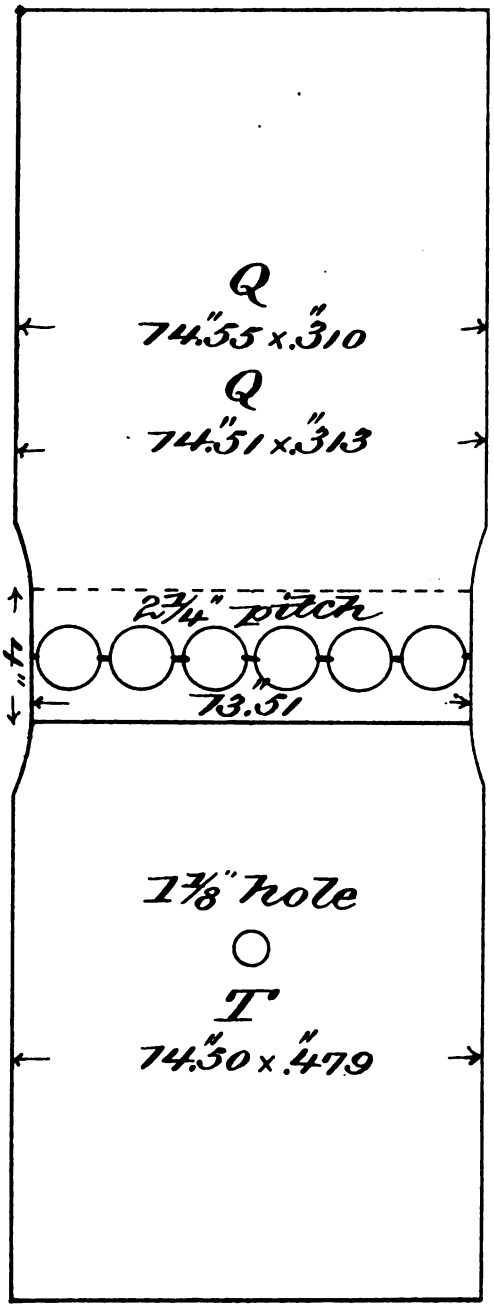
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	30,420
Tension on net section of plate	do	64,810
Compression on bearing surface of rivets	do	57,330
Shearing on rivets	do	15,410

Efficiency of joint, 51.5 per cent.

No. 1428

½" steel plate.



H Ex 31 49 2

Areas.

ross sectional area	square inches	6.471
et sectional area	do	3.238
earing surface of rivets	do	3.233
shearing area	do	11.928

[Tested at temperature of 350° Fahr.]

pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
00	40,330	.....	.....	Tensile strength.

ctured plate along line of riveting.
pearance, silky, lamellar; surfaces irregular in part, and making of 50° with rolled surface of plate in part.
a at fracture (one section), 1″.03×″.39=.4017 square inch.
traction, 25.4 per cent.
en at edges ″.02 and ″.01.
ngation of rivet-holes, ″.30, ″.29, ″.27, ″.30, ″.31.

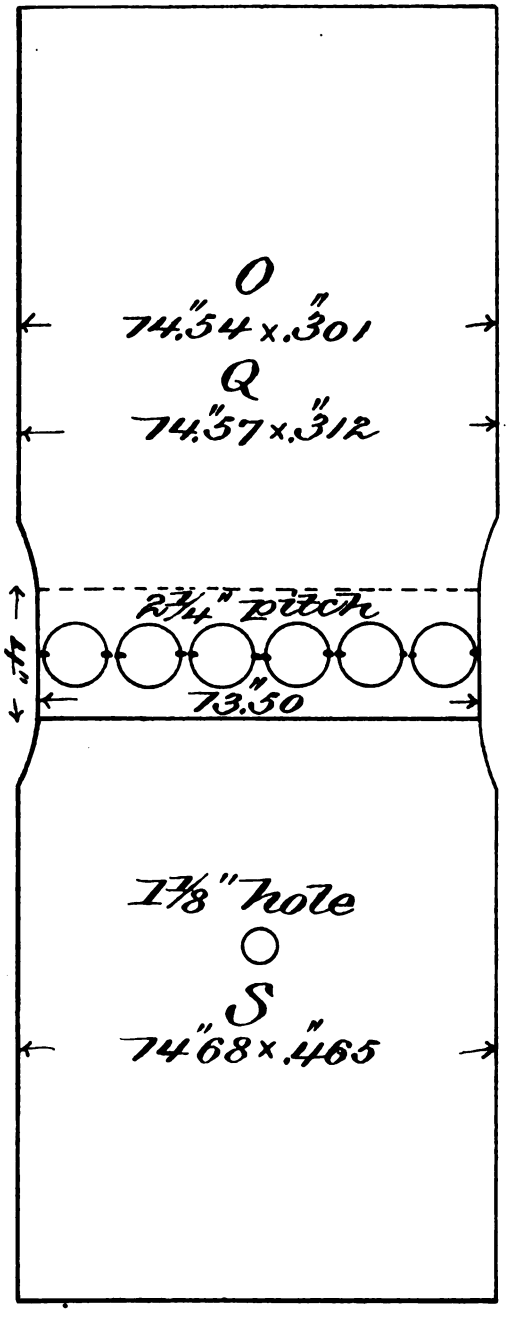
Maximum stress on joint.

on gross section of plate	pounds per square inch	40,330
on net section of plate	do	80,620
sion on bearing surface of rivets	do	80,730
g on rivets	do	21,880

ency of joint, 67.2 per cent.

No. 7429

½" steel plate



H Ex 31 ... 49 2

Areas.

·oss sectional area	square inches	0.278
·t sectional area	do	3.139
aring surface of rivets	do	3.136
·hearing area	do	11.928

›plied loads.		In gauged length.		Remarks.
ıl.	Per square inch.	Elongation.	Set.	
·ds.	*Pounds.*	*Inch.*	*Inch.*	
78	1,000	0.	0.	Initial load.
56	2,000	—.0001	.....	
34	3,000	—.0001	.....	
12	4,000	—.0001	—.0001	
90	5,000	—.0002	.....	
58	6,000	.0000	.....	
16	7,000	.0007	.....	
94	8,000	.0027	.....	
72	9,000	.0042	.....	
90	10,000	.0057	.0063	
58	11,000	.0070	.....	
36	12,000	.0075	.....	
14	13,000	.0080	.....	
92	14,000	.0087	.....	
70	15,000	.0097	.0092	
18	16,000	.0112	.....	
26	17,000	.0120	.....	
94	18,000	.0132	.....	
62	19,000	.0148	.....	
30	20,000	.0165	.0145	Rested 15 hours.
98	21,000	.0175	.....	
66	22,000	.0194	.....	
34	23,000	.0243	.....	
2	24,000	.0285	.....	
90	25,000	.0340	.0289	
58	26,000	.0440	.....	
26	27,000	.0550	.....	
94	28,000	.0680	.....	
62	29,000	.0825	.....	
0	30,000	.0995	.....	
8	31,000	.1220	.....	
6	32,000	.16	.....	
4	33,000	.20	.....	
0	33,420	.....	.....	Tensile strength.

tured plate along line of riveting.
earance, silky, slightly lamellar. Open at edges ″.10 and ″.08.
gation of rivet-holes, ″.50, ″.49, ″.46, ″.46, ″.45, ″.45.
› at fracture (one section), ″.93×″.28=.2604 square inch.
ıraction, 50.2 per cent.

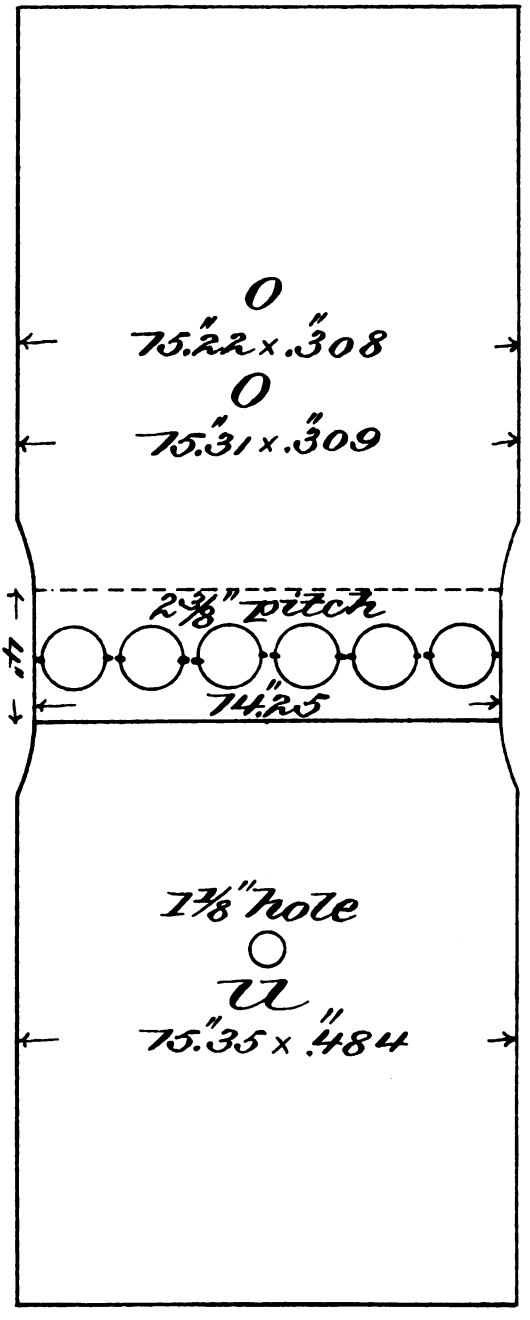
Maximum stress on joint.

n gross section of plate	pounds per square inch	33,420
n net section of plate	do	66,840
ion on bearing surface of rivets	do	66,840
›n rivets	do	17,590

›y of joint, 56.5 per cent.

No. 7430

½" steel plate



H Ex 31 49 2

Areas.

ross sectional area	square inches	6.897
et sectional area	do	3.620
earing surface of rivets	do	3.277
shearing area of rivets	do	11.928

sted at a temperature above that required to boil sperm oil, or probably about 700° Fahr.]

Applied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
,000	36,390	.....	.....	Tensile strength.

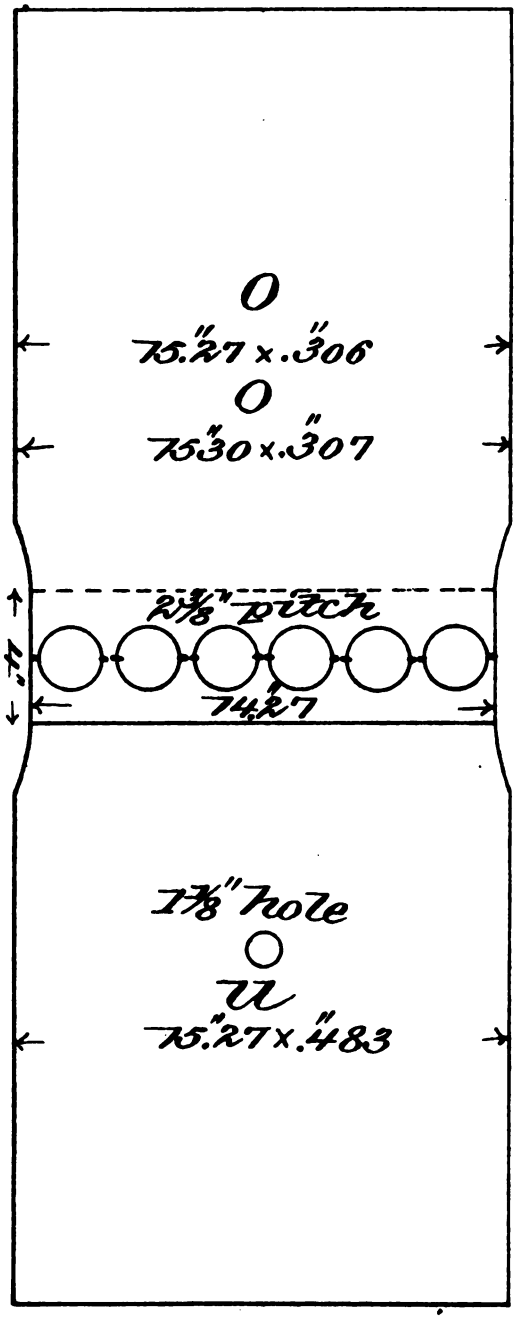
actured plate along line of riveting, with medium loud report.
e fractured surfaces were smooth and oblique to the flat surfaces e plate, making with it an angle of 47° to 48°, except the end sec-, which had irregular surfaces.
e color of the edges of the joint was a dark blue-black when the ng was done.
ter fracture the broken surfaces of the end sections were medium blue; the inner sections were varied from dark blue to dark straw ; a small part of the middle section remained uncolored.
ongation of rivet-holes, ″.39, ″.38, ″.39, ″.39, ″.41, ″.46.
ea at fracture (one section), 1″.12×″.38=.4256 square inch.
ntraction, 29.6 per cent.

Maximum stress on joint.

n on gross section of plate	pounds per square inch	36,900
n on net section of plate	do	65,150
sion on bearing surface of rivets	do	76,594
g on rivets	do	21,040

ency of joint, 62.7 per cent.

No. 74131



7/8" Steel Plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inch	6.892
Plate, net sectional area	do	3.632
Plate, bearing surface of rivets	do	3.260
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,892	1,000	0.	0.	Initial load.
13,784	2,000	.0000	.....	
20,676	3,000	.0001	.....	
27,568	4,000	.0004	.....	
34,460	5,000	.0008	.0005	
41,352	6,000	.0022	.....	
48,244	7,000	.0050	.....	
55,136	8,000	.0060	.....	
62,028	9,000	.0071	.....	
68,920	10,000	.0081	.0069	
75,812	11,000	.0096	.....	
82,704	12,000	.0107	.....	
89,596	13,000	.0120	.....	
96,488	14,000	.0129	.....	
103,380	15,000	.0142	.0117	
110,272	16,000	.0155	.....	
117,164	17,000	.0171	.....	
124,056	18,000	.0185	.....	
130,948	19,000	.0195	.....	
137,840	20,000	.0225	.0180	
144,732	21,000	.0270	.....	
151,624	22,000	.0309	.....	
158,516	23,000	.0375	.....	
165,408	24,000	.0473	.....	
172,300	25,000	.0562	.0486	
179,192	26,000	.0685	.....	
186,084	27,000	.0798	.....	
192,976	28,000	.0935	.....	
199,868	29,000	.1135	.....	
206,760	30,000	.1370	.1265	
213,652	31,000	.17	.....	
220,544	32,000	.22	.....	
227,436	33,000	.27	.....	
232,300	33,660	.37	.....	Tensile strength.

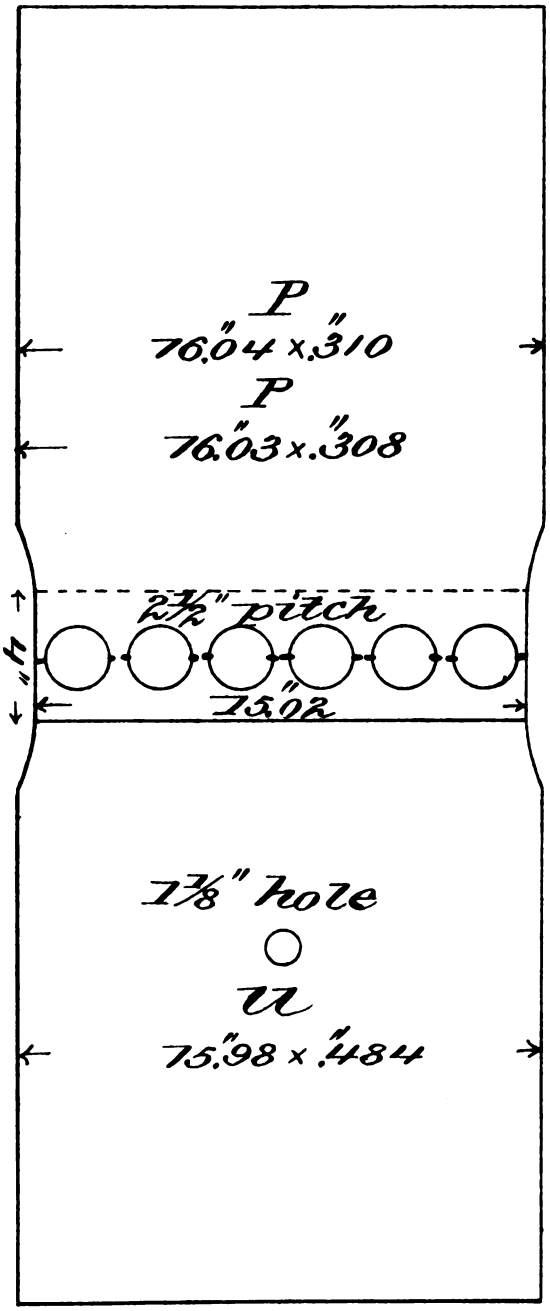
Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.15 and ″.03.
Elongation of rivet-holes, ″.56, ″.53, ″.53, ″.53, ″.53, ″.55.
Area at fracture (one section), 1″.02×″.27=.2754 square inch.
Contraction, 54.3 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	33,660
Tension on net section of plate	do	63,870
Compression on bearing surface of rivets	do	71,160
Shearing on rivets	do	19,450

Efficiency of joint, 58.0 per cent.

No 7432



1/2" steel plate

H Ex 31 49 2

Areas.

sectional area	square inches	7.270
ctional area	do	4.043
g surface of rivets	do	3.227
ring area	do	11.928

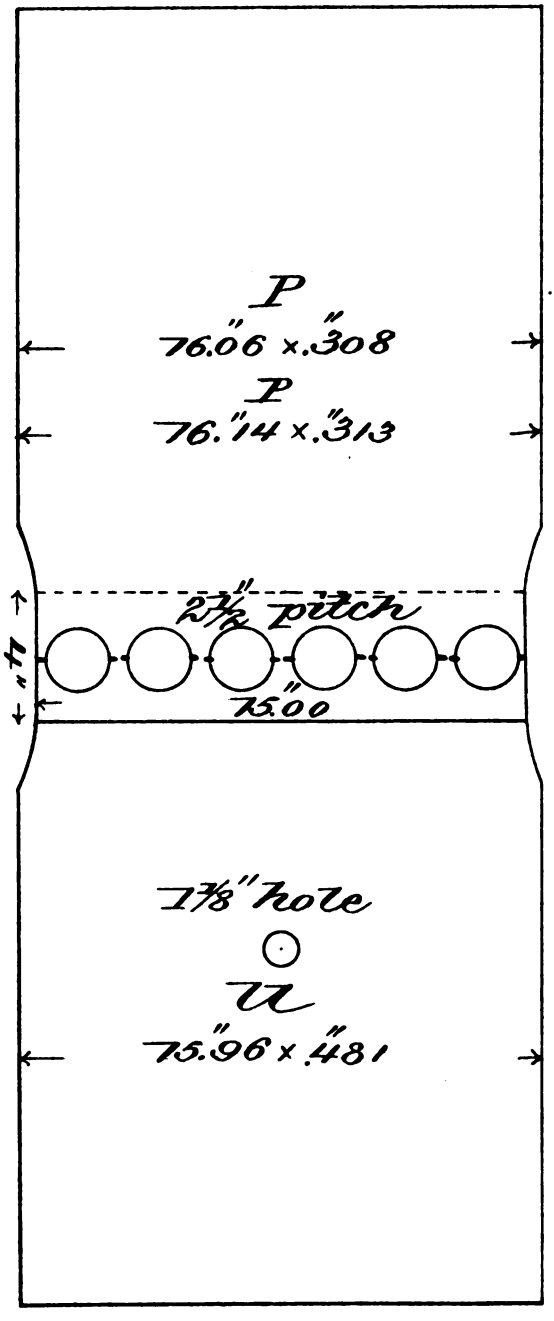
ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0004	.....	
3,000	.0008	.....	
4,000	.0019	.....	
5,000	.0040	.0028	
6,000	.0052	.....	
7,000	.0071	.....	
8,000	.0085	.....	
9,000	.0098	.....	
10,000	.0110	.0083	
11,000	.0124	.....	
12,000	.0137	.....	
13,000	.0155	.....	
14,000	.0162	.....	
15,000	.0182	.0130	
16,000	.0195	.....	
17,000	.0204	.....	
18,000	.0218	.....	
19,000	.0228	.....	
20,000	.0243	.0173	
21,000	.0270	.....	
22,000	.0298	.....	
23,000	.0335	.....	
24,000	.0413	.....	
25,000	.0519	.0425	
26,000	.0640	.....	
27,000	.0740	.....	
28,000	.0844	.....	
29,000	.1080	.....	
30,000	.1285	.1160	
31,000	.14	.....	
32,000	.18	.....	
33,000	.21	.....	
34,000	.26	.....	
35,000	.30	.....	
36,000	.40	.....	
36,140	.46	.....	Tensile strength.

ıred plate along line of riveting.
ırance, silky. Open at edges ″.05 and ″.12.
ıtion of rivet-holes, ″.62, ″.55, ″.56, ″.56, ″.56, ″.59.
ıt fracture (one section), 1″.16×″.30=.3480 square inch.
ıction, 47.7 per cent.

Maximum stress on joint.

ross section of plate	pounds per square inch	36,140
et section of plate	do	65,000
on bearing surface of rivets	do	81,430
rivets	do	22,030

of joint, 62.3 per cent.



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.215
Plate, net sectional area	do	3.968
Plate, bearing surface of rivets	do	3.247
Rivets, shearing area	do	11.928

[Tested at temperature of 500° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds 321,600	*Pounds.* 44,490	*Inch.*	*Inch.*	Tensile strength.

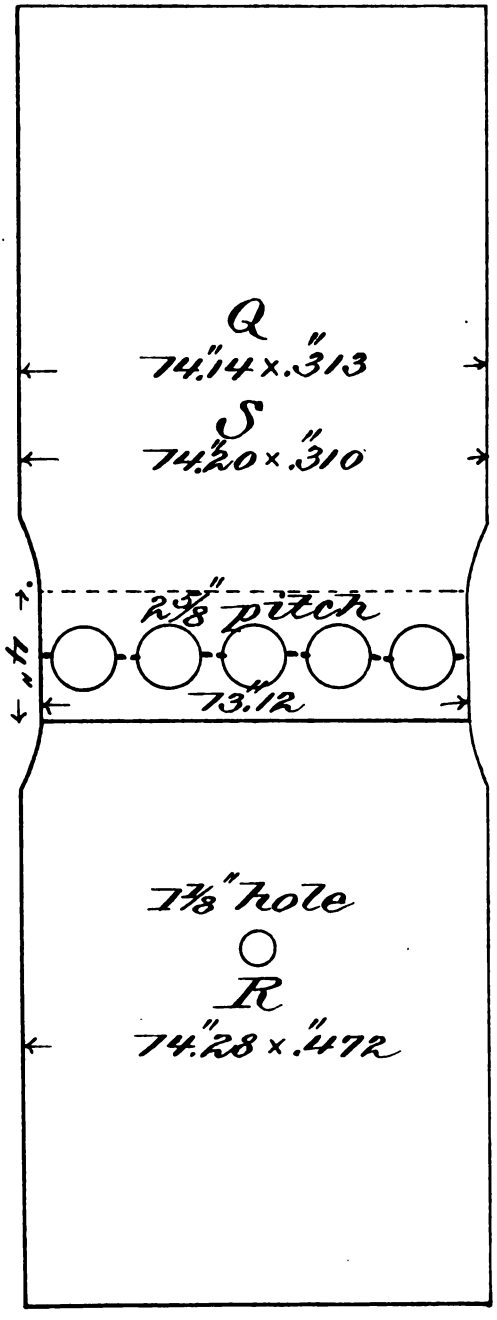
Fractured plate along line of riveting.
Appearance, silky, oblique 50°. Open at edges ″.04 and 0.
Area at fracture (one section), 1″.25×″.38=.475 square inch.
Contraction, 28.1 per cent.
Elongation of rivet-holes, ″.44, ″.39, ″.39, ″.40, ″.45, ″.48.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	44,490
Tension on net section of plate	do	81,050
Compression on bearing surface of rivets	do	99,040
Shearing area of rivets	do	26,960

Efficiency of joint, 76.7 per cent.

No. 14344



1/2" steel plate

H Ex 91 492

Areas.

gross sectional area	square inches	6.193
net sectional area	do	3.538
bearing surface of rivets	do	2.655
shearing area of rivets	do	9.940

Applied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
193	1,000	0.	0.	Initial load.
386	2,000	.0002	.....	
579	3,000	.0004	.....	
772	4,000	.0005	.....	
965	5,000	.0008	.0007	
158	6,000	.0015	.....	
351	7,000	.0037	.....	
544	8,000	.0053	.....	
737	9,000	.0063	.....	
930	10,000	.0074	.0070	
123	11,000	.0098	.....	
316	12,000	.0105	.....	
509	13,000	.0110	.....	
702	14,000	.0123	.....	
895	15,000	.0138	.0127	
088	16,000	.0152	.....	
281	17,000	.0160	.....	
474	18,000	.0172	.....	
667	19,000	.0185	.....	
860	20,000	.0193	.0165	
053	21,000	.0205	.....	
246	22,000	.0270	.....	
339	23,000	.0325	.....	
332	24,000	.0420	.....	
125	25,000	.0520	.0463	
118	26,000	.0652	.....	
311	27,000	.0790	.....	
504	28,000	.0925	.....	
697	29,000	.1115	.....	
890	30,000	.1325	.1217	
083	31,000	.17	.....	
176	32,000	.19	.....	
169	33,000	.24	.....	Sustained this load ½ minute, then released to zero and allowed to rest 2 hours; then loads applied and the joint ruptured.
100	36,670	.....	.....	Tensile strength.

ictured plate along line of riveting.
pearance, silky, lamellar. Open at edges ″.15 each.
ngation of rivet-holes, ″.64, ″.59, ″.59, ″.63, ″.69.
ea at fracture (one section), 1″.27 × ″.29 = .3683 square inch.
ntraction, 47.9 per cent.

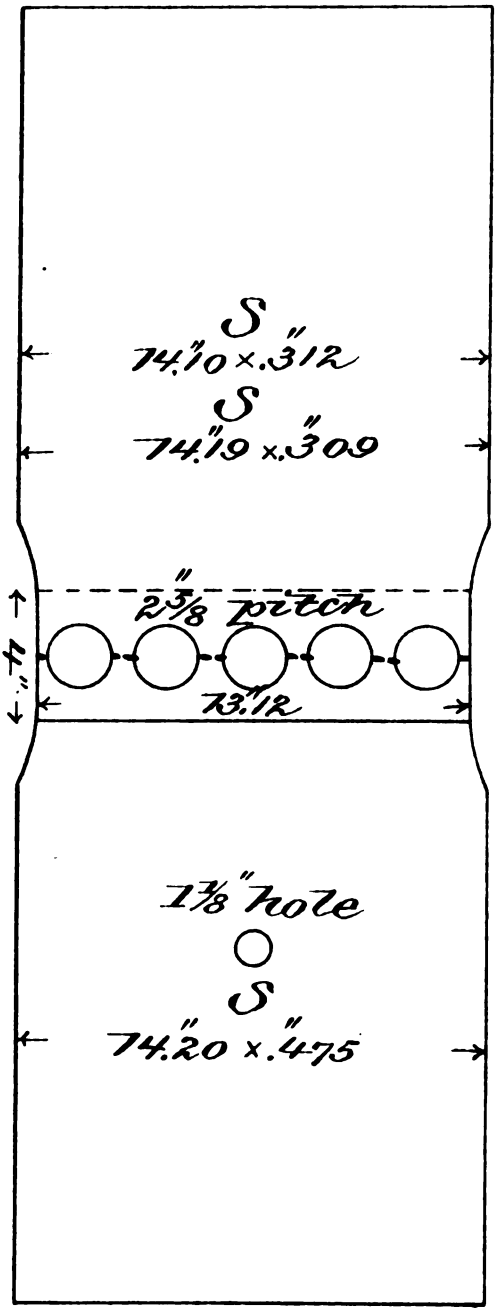
Maximum stress on joint.

on gross section of plate	pounds per square inch	36,670
on net section of plate	do	64,190
sion on bearing surface of rivets	do	85,540
g on rivets	do	22,850

ncy of joint, 62.0 per cent.

No. 7435

½" steel plate



H Ex 31 49 2

Areas.

sectional area	square inches	6.232
ctional area	do	3.560
ıg surface of rivets	do	2.672
ring area	do	9.940

›d loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0003	.....	
3,000	.0006	.....	
4,000	.0007	.....	
5,000	.0006	.0004	
6,000	.0016	.....	
7,000	.0037	.....	
8,000	.0048	.....	
9,000	.0056	.....	
10,000	.0069	.0058	
11,000	.0096	.....	
12,000	.0112	.....	
13,000	.0121	.....	
14,000	.0126	.....	
15,000	.0136	.0101	
16,000	.0145	.....	
17,000	.0153	.....	
18,000	.0165	.....	
19,000	.0181	.....	
20,000	.0211	.0164	
21,000	.0256	.....	
22,000	.0295	.....	
23,000	.0333	.....	
24,000	.0393	.....	
25,000	.0476	.0404	
26,000	.0586	.....	
27,000	.0722	.....	
28,000	.0896	.....	
29,000	.1080	.....	
30,000	.1330	.....	
31,000	.15	.....	
32,000	.17	.....	
33,000	.22	.....	
34,000	.26	.....	
35,000	.30	.....	
36,000	.38	.....	
36,200	.45	.....	Tensile strength.
.....	.....	.....	Load at time of fracture.

ıred plate along line of riveting.
ırance, silky, lamellar. Open at edges ″.08 each.
ation of rivet-holes, ″.61, ″.58, ″.56, ″.55, ″.59.
ıt fracture (one section), 1″.28×″.28=.3584 square inch.
ıction, 49.7 per cent.

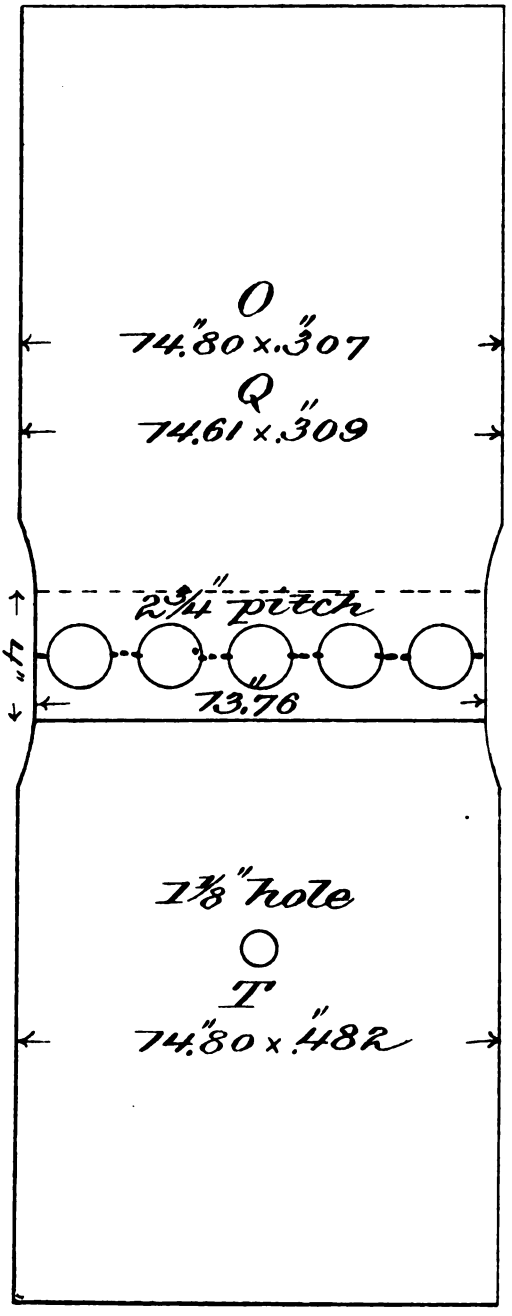
Maximum stress on joint.

;ross section of plate	pounds per square inch	36 200
ıet section of plate	do	63 370
ı on bearing surface of rivets	do	84, 420
rivets	do	22, 690

of joint, 61.2 per cent.

No. 7436

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.632
Plate, net sectional area	do	3.921
Plate, bearing surface of rivets	do	2.711
Rivets, shearing area	do	9.940

[Tested at temperature of 600° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
280,800	42,340	.....	.....	Tensile strength.

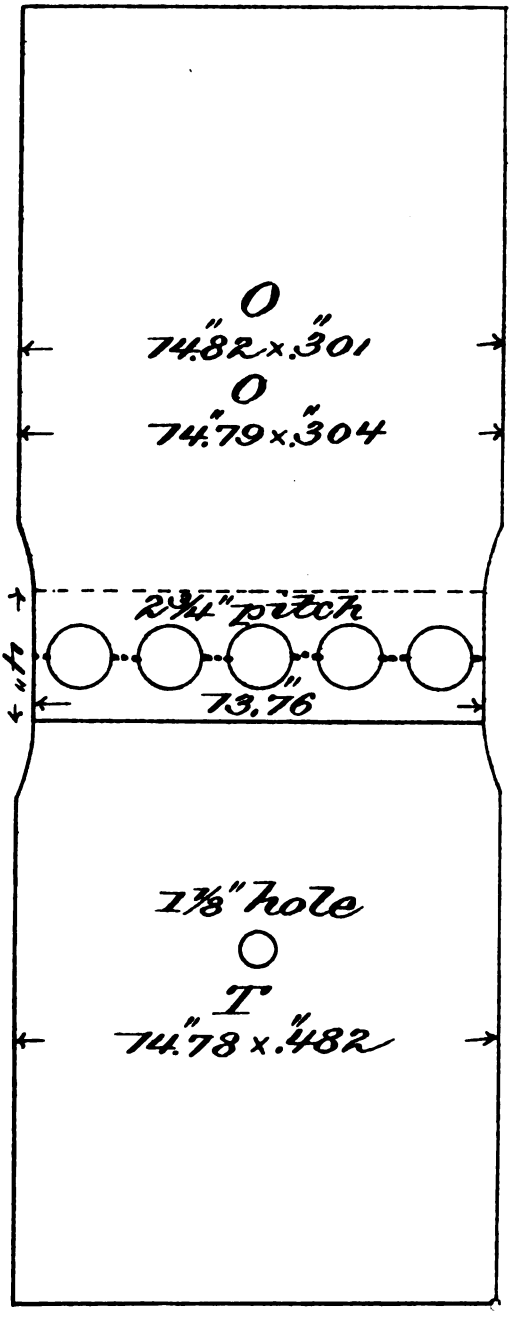
Fractured plate along line of riveting.
Appearance, silky; resembles shearing fractures. Oblique, 50°.
Area at fracture (one section), 1″.52×″.39=.5928 square inch.
Contraction, 24.3 per cent. Open at edges, ″.05 and ″.07.
Elongation of rivet-holes, ″.55, ″.49, ″.49, ″.51, ″.61.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	42,340
Tension on net section of plate	do	71,610
Compression on bearing surface of rivets	do	103,580
Shearing on rivets	do	28,250

Efficiency of joint, 70.5 per cent.

No. 7437



½" steel plate

H Ex 31 49 2

Areas.

oss sectional area	square inches..	6.632
t sectional area	do....	3.921
aring surface of rivets	do....	2.711
hearing area	do....	9.940

plied loads.		In gauged length.		Remarks.
l.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
2	1,000	0.	0.	Initial load.
4	2,000	.0002	.....	
6	3,000	.0005	.....	
8	4,000	.0007	.....	
0	5,000	.0015	.0013	
2	6,000	.0030	.....	
4	7,000	.0050	.....	
6	8,000	.0060	.....	
8	9,000	.0070	.....	
0	10,000	.0082	.0065	
2	11,000	.0100	.....	
4	12,000	.0114	.....	
6	13,000	.0125	.....	
8	14,000	.0135	.....	
0	15,000	.0150	.0115	
2	16,000	.0176	.....	
4	17,000	.0190	.....	
6	18,000	.0205	.....	
8	19,000	.0220	.....	
0	20,000	.0237	.0183	
2	21,000	.0273	.....	
4	22,000	.0297	.....	
6	23,000	.0328	.....	
8	24,000	.0415	.....	
0	25,000	.0518	.0438	
2	26,000	.0666	.....	
4	27,000	.0813	.....	
6	28,000	.09	.....	
8	29,000	.11	.....	
0	30,000	.14	.....	
2	31,000	.17	.....	
4	32,000	.18	.....	
6	33,000	.20	.....	
8	34,000	.25	.....	
0	35,000	.29	.....	
2	36,000	.35	.....	
4	37,000	.41	.....	
6	38,000	.48	.....	
0	38,720	.....	.....	Tensile strength.

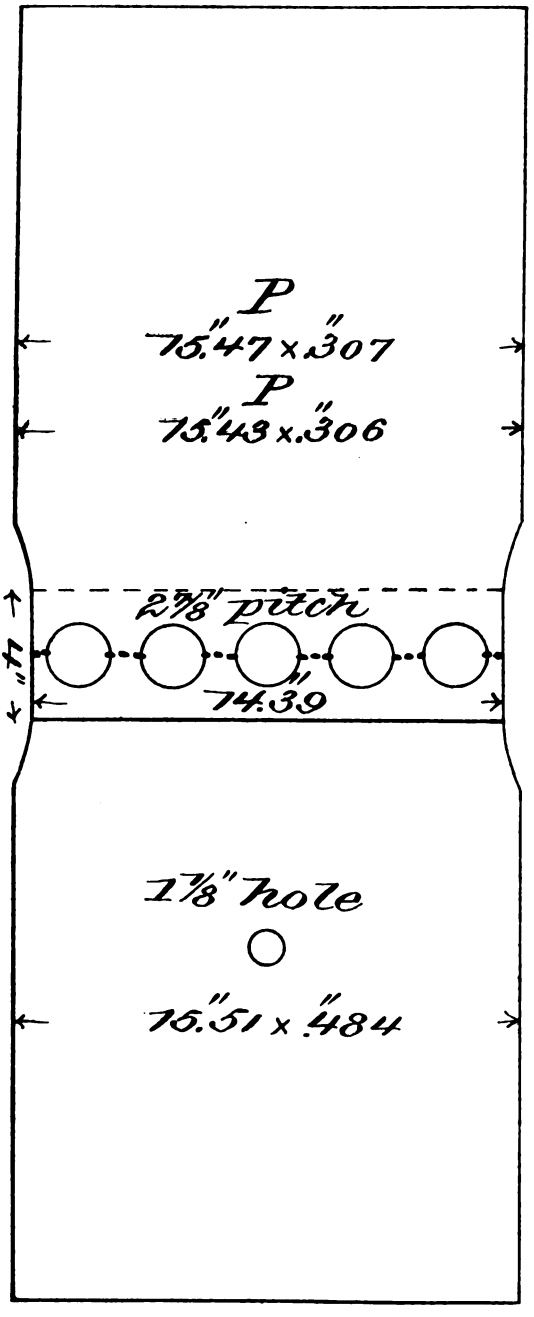
ctured plate along line of riveting.
earance, silky. Open at edges ″.25 and ″.10.
gation of rivet-holes, ″.78, ″.72, ″.70, ″.70, ″.72.
a at fracture (one section), 1″.42×″.30=.4260 square inch
traction, 45.6 per cent.

Maximum stress on joint.

n gross section of plate	pounds per square inch..	38,720
n net section of plate	do....	65,440
ion on bearing surface of rivets	do....	94,730
on rivets	do....	25,840

cy of joint, 64.5 per cent.

No. 7438



Steel plate

H Ex 31 49 2

Areas.

ross sectional area	square inches..	6.965
et sectional area	do....	4.248
earing surface of rivets	do....	2.722
shearing area	do....	9.940

[Tested at a temperature of 500° Fahr.]

pplied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
800	46,630	.....	.....	Tensile strength.

ctured plate along line of riveting.
pearance, silky, slightly lamellar. Oblique fractures, 50°.
ea at fracture (one section), 1″.57 × ″.37 = .5809 square inch.
atraction, 31.4 per cent. Open at edges ″.03 and 0.
ngation of rivet-holes, ″.69, ″.62, ″.58, ″.56, ″.59.

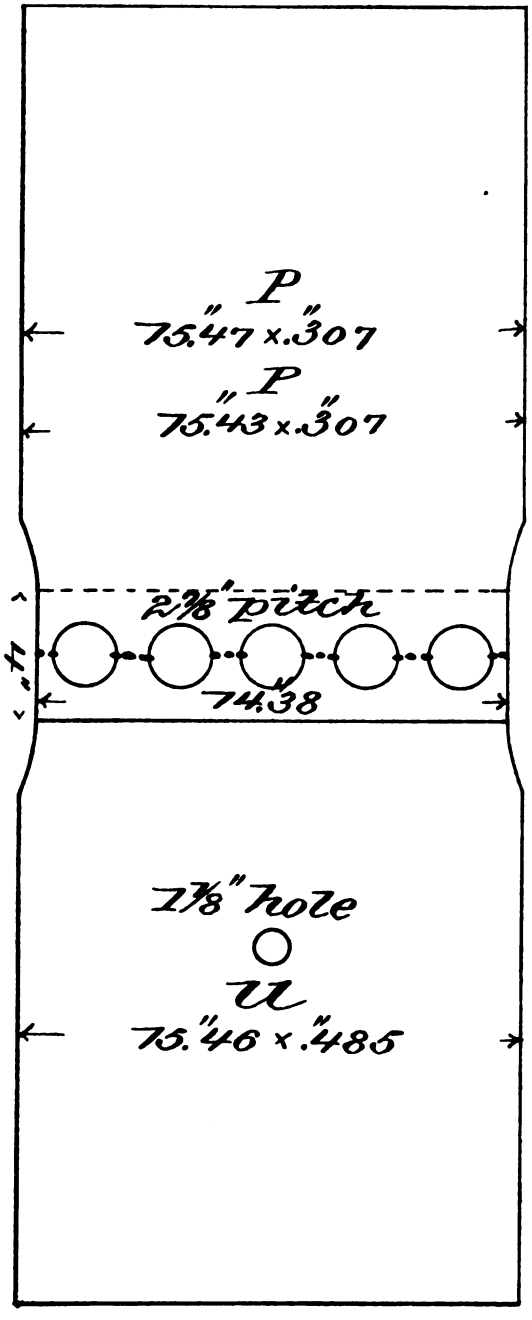
Maximum stress on joint.

on gross section of plate	pounds per square inch..	46,630
on net section of plate	do....	76,550
asion on bearing surface of rivets	do....	119,520
g on rivets	do....	32,680

ency of joint, 80.3 per cent.

No. 7439

1/2" Steel Plate



H Ex 31 49 2

Areas.

s sectional area	square inches	6.974
sectional area	do	4.246
ing surface of rivets	do	2.728
aring area	do	9.940

lied loads.		In gauged length.		Remarks.
	Per square inch.	Elongation.	Set.	
	Pounds.	*Inch.*	*Inch.*	
	1,000	0.	0.	Initial load.
	2,000	.0001	.....	
	3,000	.0002	.....	
	4,000	.0005	.....	
	5,000	.0023	.0016	
	6,000	.0041	.....	
	7,000	.0062	.....	
	8,000	.0076	.....	
	9,000	.0085	.....	
	10,000	.0096	.0080	
	11,000	.0111	.....	
	12,000	.0126	.....	
	13,000	.0141	.....	
	14,000	.0161	.....	
	15,000	.0176	.0144	
	16,000	.0197	.....	
	17,000	.0211	.....	
	18,000	.0225	.....	
	19,000	.0241	.....	
	20,000	.0256	.0203	
	21,000	.0286	.....	
	22,000	.0301	.....	
	23,000	.0327	.....	
	24,000	.0401	.....	
	25,000	.0574	.....	
	26,000	.0698	.....	
	27,000	.0850	.....	
	28,000	.1025	.....	
	29,000	.1225	.....	
	30,000	.14	.....	
	31,000	.16	.....	
	32,000	.18	.....	
	33,000	.23	.....	
	34,000	.27	.....	
	35,000	.33	.....	
	36,000	.37	.....	
	37,000	.45	.....	
	38,000	.52	.....	
	38,900	.....	.....	Tensile strength.

tured plate along line of riveting.
earance, silky, lamellar. Metal well drawn down. Open at
'.15 each.
gation of rivet-holes, ″.86, ″.78, ″.77, .″.77, ″.84.
at fracture (one section), 1″.50×″.29=.435 square inch.
raction, 48.7 per cent.

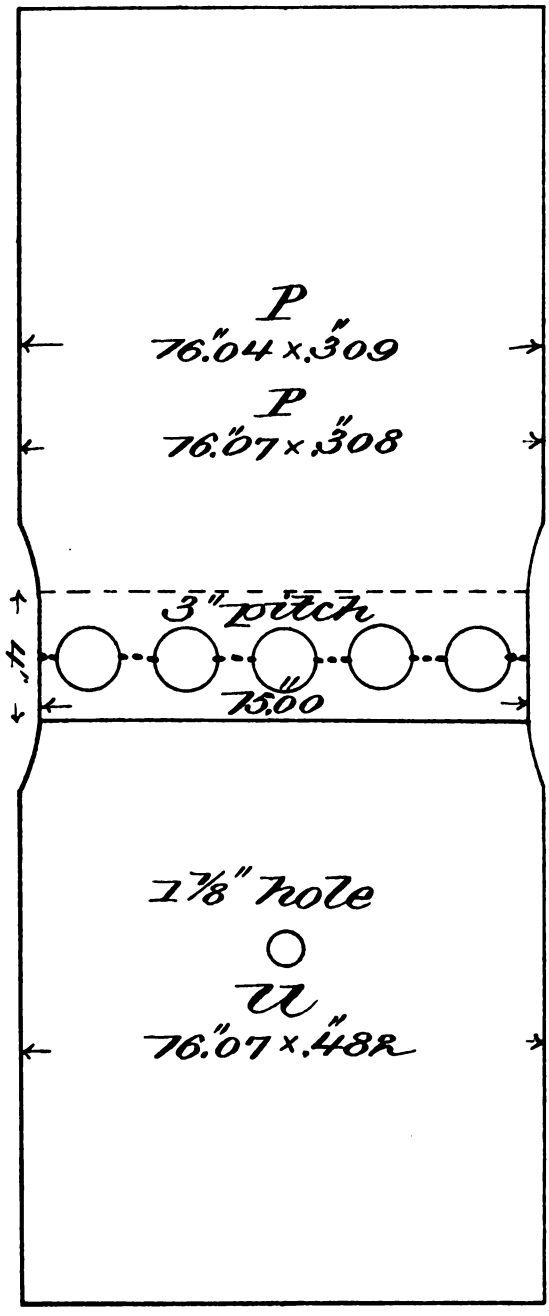
Maximum stress on joint.

a gross section of plate	pounds per square inch	38,900
a net section of plate	do	63,890
on on bearing surface of rivets	do	99,450
n rivets	do	27,290

y of joint, 67.0 per cent.

No. 74440

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.23
Plate, net sectional area	do	4.510
Plate, bearing surface of rivets	do	2.719
Rivets, shearing area	do	9.941

[Tested at temperature of 200° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
283,300	39,180	.....	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar. Open at edges ″.05 and ″.10; at fifth section ″.15.

Area at fracture (one section), 1″.67 × ″.32 = .5344 square inch.

Contraction, 40.8 per cent.

Elongation of rivet-holes, ″.66, ″.65, ″.70, ″.80, ″.95.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	39,180
Tension on net section of plate	do	62,690
Compression on bearing surface of rivets	do	104,500
Shearing on rivets	do	28,500

Efficiency of joint, 67.5 per cent.

No. 1111

7/16" Steel Plate

...osing area ...

...ied loads.

	Per square inch.
	Pounds.
1	1,000
2	1,000
3	1,000
4	1,000
5	1,000
6	1,000
7	1,000
8	1,000
9	1,000
10	1,000
11	1,000
12	1,000
13	1,000
14	1,000
15	1,000
16	1,000
17	1,000
18	1,000
19	1,000
20	1,000
21	[illegible]
[illegible]	[illegible]

Areas.

sectional area	square inches..	7.250
ctional area	do....	4.528
ıg surface of rivets	do....	2.722
ring area	do....	9.940

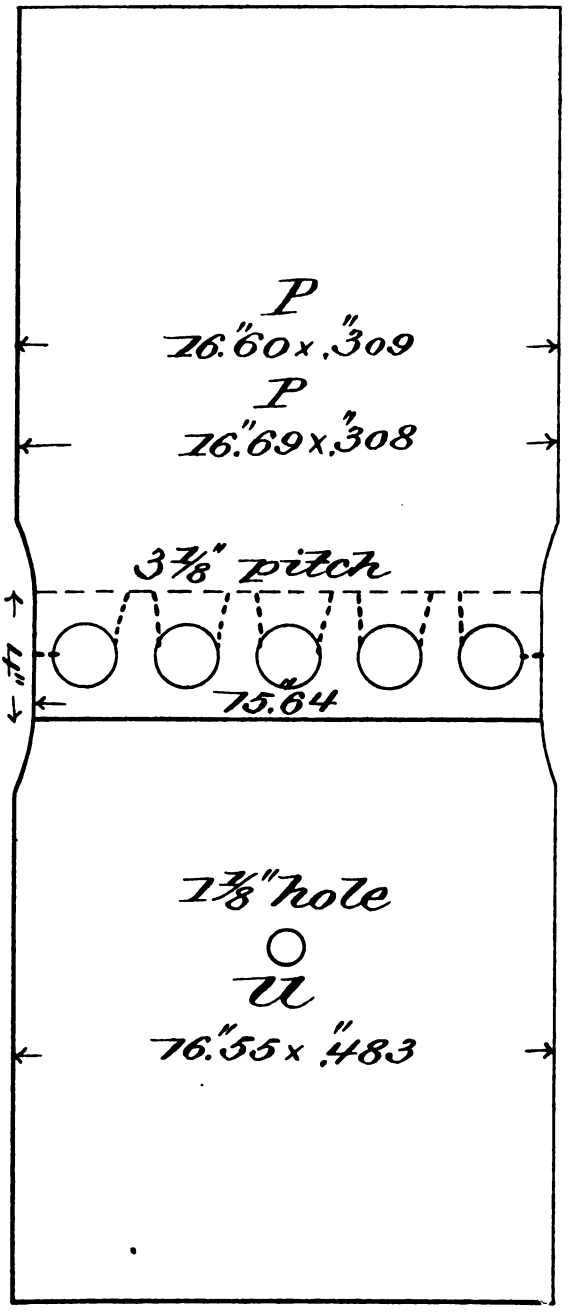
ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0002	.....	
3,000	.0005	.....	
4,000	.0009	.....	
5,000	.0024	.0018	
6,000	.0044	.....	
7,000	.0069	.....	
8,000	.0090	.....	
9,000	.0113	.....	
10,000	.0126	.0118	
11,000	.0139	.....	
12,000	.0148	.....	
13,000	.0161	.....	
14,000	.0177	.....	
15,000	.0190	.0154	
16,000	.0208	.....	
17,000	.0220	.....	
18,000	.0230	.....	
19,000	.0245	.....	
20,000	.0260	.0203	
21,000	.0290	.....	
22,000	.0318	.....	
23,000	.0370	.....	
24,000	.0470	.....	
25,000	.0655	.0560	
26,000	.08	.....	
27,000	.10	.....	
28,000	.12	.....	
29,000	.13	.....	
30,000	.16	.....	
31,000	.18	.....	
32,000	.21	.....	
33,000	.23	.....	
34,000	.28	.....	
35,000	.33	.....	
36,000	.38	.....	
37,000	.45	.....	
38,000	.52	.....	
39,000	.60	.....	
40,000	.72	.....	
40,630	.90	.....	Tensile strength.

ıred plate along line of riveting.
ırance, silky, slight lamination. Open at edges ″.20 and ″.10.
ıt fracture (one section), 1″.61×″.30=.4830 square inch.
ıction, 46.6 per cent.
ıation of rivet-holes, ″.95, ″.86, ″.86, ″.88, ″.92.

Mamimum stress on joint.

gross section of plate	pounds per square inch..	40,630
net section of plate	do....	65,060
ı on bearing surface of rivets	do....	108,220
rivets	do....	29,630

of joint, 70.9 per cent.



H Ex 31 49 2

Areas.

ss sectional area	square inches	7.554
sectional area	do	4.837
ring surface of rivets	do	2.717
earing area	do	9.940

plied loads.		In gauged length.		Remarks.
	Per square inch.	Elongation.	Set.	
s.	*Pounds.*	*Inch.*	*Inch.*	
	1,000	0.	0.	Initial load.
	2,000	0.	.....	
	3,000	.0002	.....	
	4,000	.0007	.....	
	5,000	.0026	.0021	
	6,000	.0038	.....	
	7,000	.0053	.....	
	8,000	.0063	.....	
	9,000	.0072	.....	
	10,000	.0087	.0074	
	11,000	.0107	.....	
	12,000	.0119	.....	
	13,000	.0140	.....	
	14,000	.0153	.....	
	15,000	.0159	.0121	
	16,000	.0183	.....	
	17,000	.0193	.....	
	18,000	.0204	.....	
	19,000	.0224	.....	
	20,000	.0251	.0193	
	21,000	.0278	.....	
	22,000	.0304	.....	
	23,000	.0347	.....	
	24,000	.0433	.....	
	25,000	.0651	.0553	
	26,000	.0898	.....	
	27,000	.1110	.....	
	28,000	.13	.....	
	29,000	.17	.....	
	30,000	.20	.....	
	31,000	.22	.....	
	32,000	.27	.....	
	33,000	.31	.....	
	34,000	.38	.....	
	35,000	.45	.....	
	36,000	.55	.....	
	37,000	.63	.....	
	38,000	.80	.....	
	38,570	.....	.....	Tensile strength.

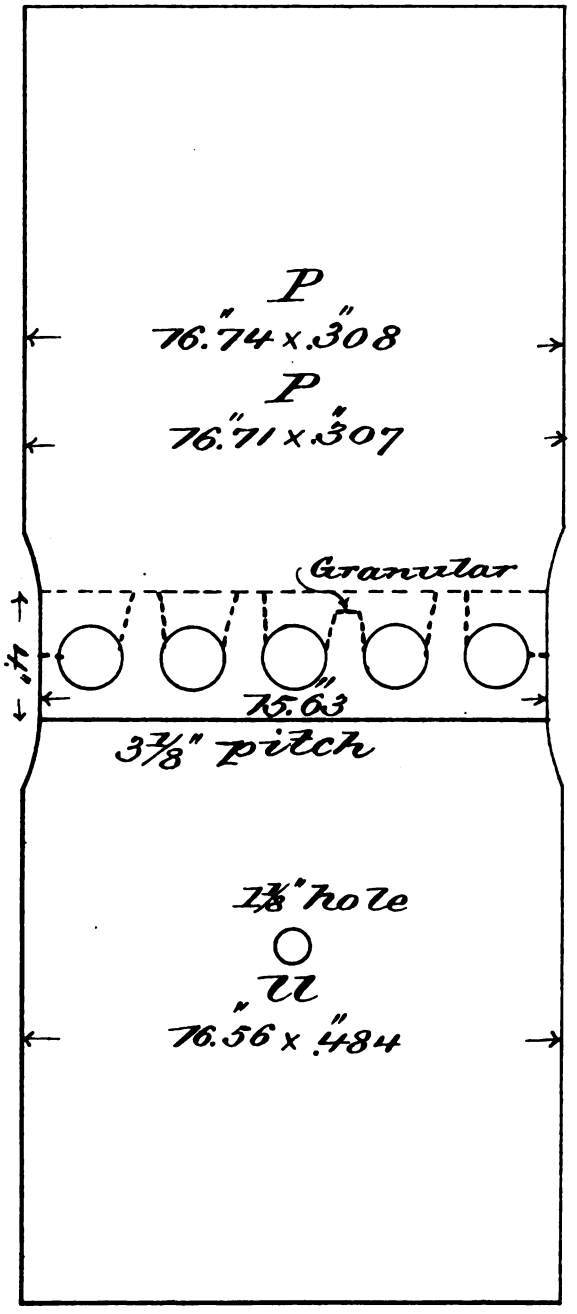
out plate in front of rivets. Shearing fractures, in part granular section.

gation of rivet-holes, 1″.07, 1″.15, 1″.05, 1″.14, ″.89.

Maximum stress on joint.

n gross section of plate	pounds per square inch	38,570
n net section of plate	do	60,450
ion on bearing surface of rivets	do	107,610
on rivets	do	29,410

cy of joint, 67.2 per cent.


P
76."74 x ."308
P
76."71 x ."307
Granular
4"
75."63
3 7/8" pitch
1 1/8" hole
U
76."56 x ."484

H Ex 31 49 2

Areas.

sectional area	square inches..	7.565
ctional area	do....	4.843
ıg surface of rivets	do....	2.722
ıring area	do....	9.940

lied loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0003	.....	
3,000	.0005	.....	
4,000	.0007	.....	
5,000	.0014	.0010	
6,000	.0022	.....	
7,000	.0030	.....	
8,000	.0040	.....	
9,000	.0049	.....	
10,000	.0062	.0043	
11,000	.0079	.....	
12,000	.0089	.....	
13,000	.0106	.....	
14,000	.0116	.....	
15,000	.0132	.0103	
16,000	.0159	.....	
17,000	.0172	.....	
18,000	.0187	.....	
19,000	.0204	.....	
20,000	.0225	.0173	
21,000	.0262	.....	
22,000	.0291	.....	
23,000	.0331	.....	
24,000	.0402	.....	
25,000	.0617	.0572	
26,000	.0875	.....	
27,000	.1059	.....	
28,000	.1292	.....	
29,000	.16	.....	
30,000	.18	.....	
31,000	.21	.....	
32,000	.26	.....	
33,000	.30	.....	
34,000	.37	.....	
35,000	.43	.....	
36,000	.51	.....	
37,000	.61	.....	
38,000	.75	.....	
39,000	.98	.....	
39,60	1.10	.....	Tensile strength.

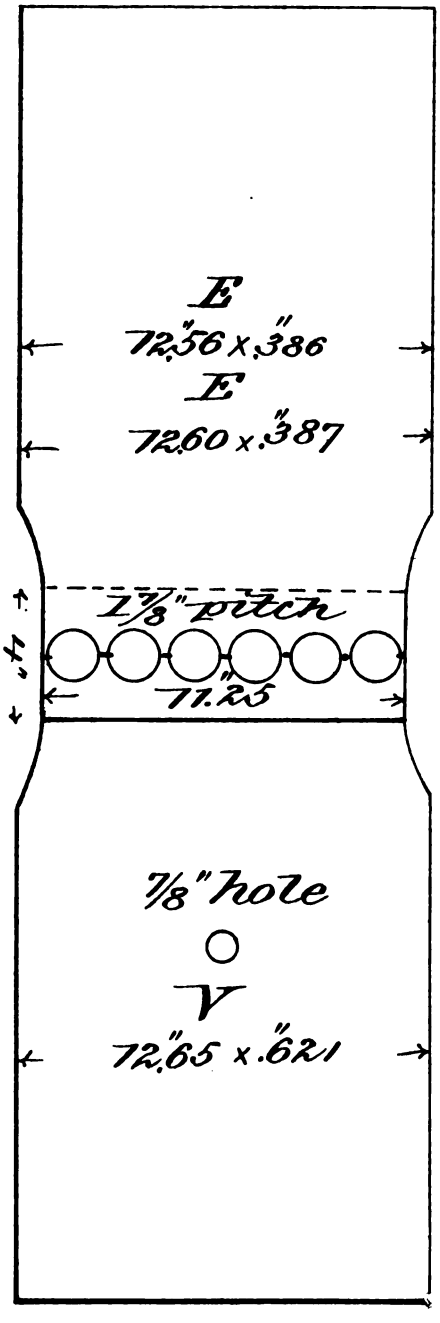
plate out in front of rivets. Shearing fractures, in part granular ection.

Maximum stress on joint.

gross section of plate	pounds per square inch..	29,160
net section of plate	do....	61,170
on bearing surface of rivets	do....	108,830
rivets	do....	29,800

y of joint, 68.2 per cent.

No. 74444



5/8" Steel Plate

H Ex 31

Areas.

ss sectional area	square inches	6.986
sectional area	do	3.726
ring surface of rivets	do	3.260
earing area	do	7.216

plied loads.		In gauged length.		Remarks.
l.	Per square inch.	Elongation.	Set.	
ls.	*Pounds.*	*Inch.*	*Inch.*	
6	1,000	0.	0.	Initial load.
2	2,000	.0002	.....	
8	3,000	.0005	.....	
4	4,000	.0009	.....	
0	5,000	.0013	.0011	
6	6,000	.0051	.....	
2	7,000	.0065	.....	
8	8,000	.0074	.....	
4	9,000	.0081	.....	
0	10,000	.0089	.0067	
6	11,000	.0105	.....	
2	12,000	.0122	.....	
8	13,000	.0131	.....	
4	14,000	.0145	.....	
0	15,000	.0165	.0123	
6	16,000	.0186	.....	
2	17,000	.0210	.....	
8	18,000	.0228	.....	
4	19,000	.0247	.....	
0	20,000	.0275	.0198	
6	21,000	.0307	.....	
2	22,000	.0338	.....	
8	23,000	.0398	.....	
4	24,000	.0510	.....	
0	25,000	.0625	.0525	
6	26,000	.0751	.....	
2	27,000	.0887	.....	
8	28,000	.1038	.....	
4	29,000	.115	.....	
0	30,000	.13	.....	
6	31,000	.17	.....	
2	32,000	.20	.....	
8	33,000	.26	.....	
0	33,750	.35	.....	Tensile strength.

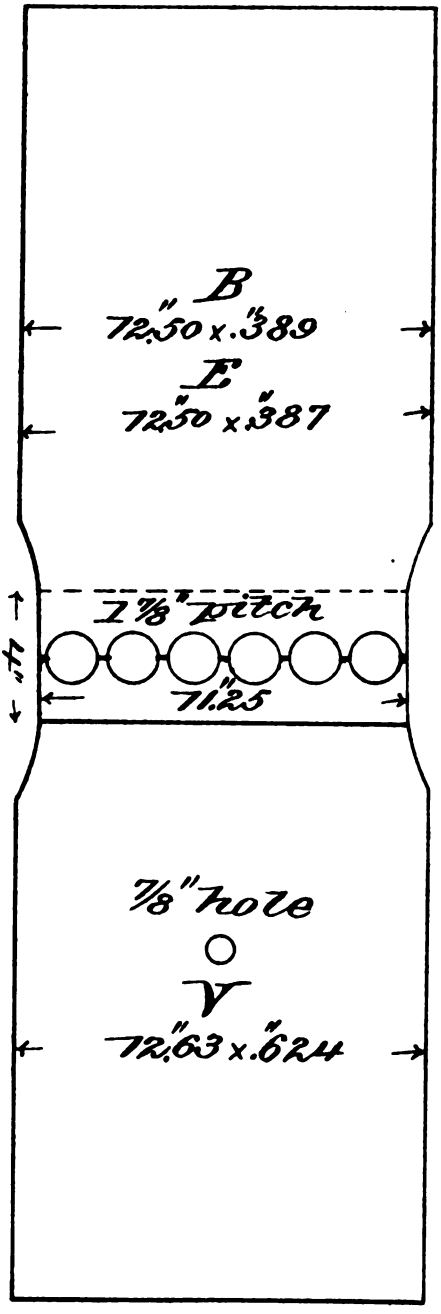
ctured plate along line of riveting.
earance, silky, lamellar. Open at edges ″.15 each.
ngation of rivet-holes, ″.49, ″.52, ″.48, ″.50, ″.52, ″.55.
a at fracture (one section), ″.78×″.37=.2886 square inch.
traction, 53.5 per cent.

Maximum stress on joint.

on gross section of plate	pounds per square inch	33,750
on net section of plate	do	63,280
ssion on bearing surface of rivets	do	72,330
g on rivets	do	32,670

ency of joint. 60.1 per cent.

No. 7445



5/8" steel plate

H Ex 31 49 2

Areas.

ıs sectional area	square inches..	7.020
sectional area	do....	3.744
ring surface of rivets	do....	3.276
earing area	do....	7.216

ılied loads.		In gauged length.		Remarks.
	Per square inch.	Elongation.	Set.	
ı.	*Pounds.*	*Inch.*	*Inch.*	
	1,000	0.	0.	Initial load.
	2,000	.0004	.....	
	3,000	.0007	.....	
	4,000	.0009	.....	
	5,000	.0012	.0001	
	6,000	.0012	.....	
	7,000	.0017	.....	
	8,000	.0022	.....	
	9,000	.0036	.....	
	10,000	.0048	.0023	
	11,000	.0058	.....	
	12,000	.0067	.....	
	13,000	.0077	.....	
	14,000	.0088	.....	
	15,000	.0098	.0055	
	16,000	.0109	.....	
	17,000	.0122	.....	
	18,000	.0134	.....	
	19,000	.0150	.....	
	20,000	.0168	.0108	
	21,000	.0203	.....	
	22,000	.0244	.....	
	23,000	.0298	.....	
	24,000	.0382	.....	
	25,000	.0488	.0398	
	26,000	.0623	.....	
	27,000	.0758	.....	
	28,000	.0908	.....	
	29,000	.1084	.....	
	30,000	.13	.....	Scale starts off plate.
	31,000	.16	.....	
	32,000	.19	.....	
	33,000	.24	.....	
	34,000	.30	.....	
	34,530	.40	.....	Tensile strength.

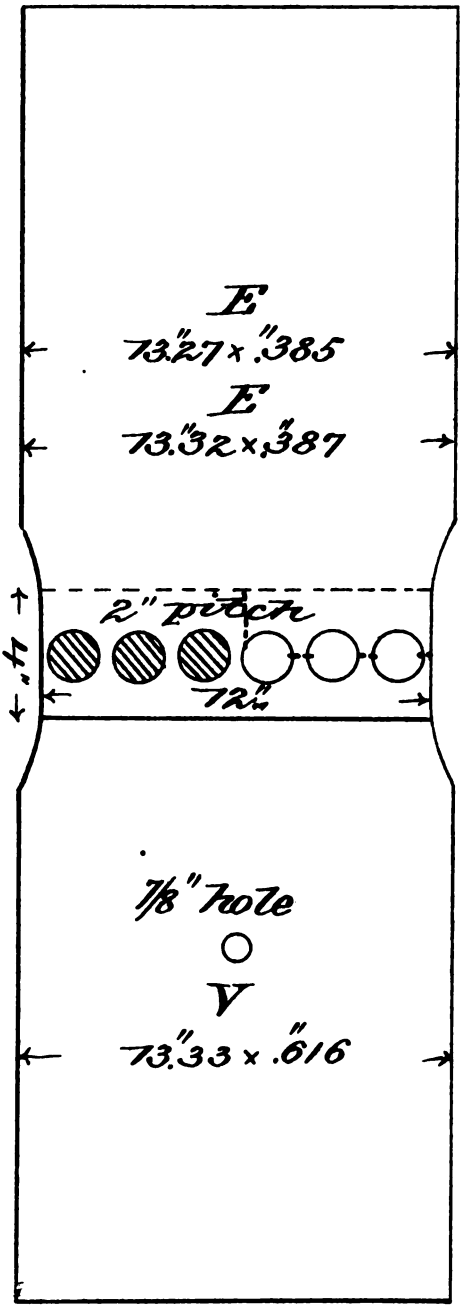
ıured plate along line of riveting.
arance, silky, lamellar. Open at edges ″.12 and ″.10.
ɣation of rivet-holes, ″.49, ″.49, ″.46, ″.46, ″.46, ″.47.
at fracture (one section), ″.78×″.39=.3042 square inch.
action, 51.2 per cent.

Maximum stress on joint.

gross section of plate	pounds per square inch..	34,530
net section of plate	do....	64,740
n on bearing surface of rivets	do....	74,000
ı rivets	do....	33,590

· of joint, 63.7 per cent.

No. 14146



5/8" steel plate

H Ex 31 492

Areas.

s sectional area	square inches..	7.392
ectional area	do....	4.158
ing surface of rivets	do....	3.234
aring area	do....	7.216

lied loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0002	.....	
3,000	.0005	.....	
4,000	.0007	.....	
5,000	.0012	.0007	
6,000	.0037	.....	
7,000	.0047	.....	
8,000	.0054	.....	
9,000	.0062	.....	
10,000	.0072	.0052	
11,000	.0081	.....	
12,000	.0096	.....	
13,000	.0113	.....	
14,000	.0131	.....	
15,000	.0143	.0102	
16,000	.0170	.....	
17,000	.0196	.....	
18,000	.0222	.....	
19,000	.0244	.....	
20,000	.0263	.0187	
21,000	.0277	.....	
22,000	.0292	.....	
23,000	.0307	.....	
24,000	.0342	.....	
25,000	.0448	.0357	
26,000	.0585	.....	
27,000	.0692	.....	
28,000	.0820	.....	
29,000	.0935	.....	
30,000	.1140	.....	
31,000	.135	.....	
32,000	.17	.....	
33,000	.20	.....	
34,000	.22	.....	
35,000	.27	.....	
36,000	.36	.....	
36,760	.43	.....	Tensile strength.

ed three rivets, and fractured the plate along line of riveting
hree sections.
arance, silky, lamellar.
at fracture (one section), ″.93×″.39=.3627 square inch.
action, 47.6 per cent.
ation of rivet-holes (″.21, ″.27, ″.31 sheared rivets in these
′.62, ″.49, ″.43.

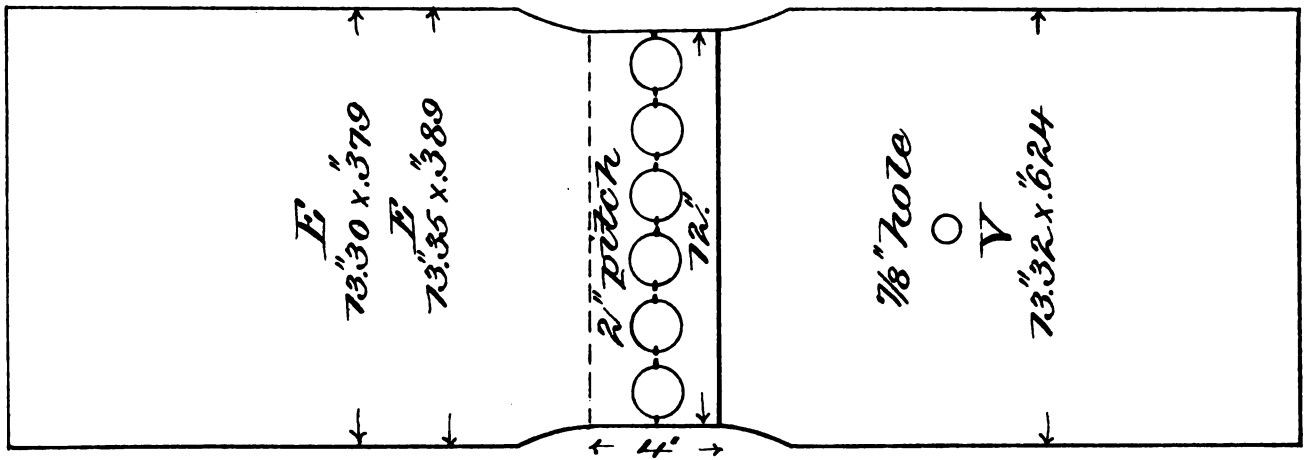
Maximum stress on joint.

gross section of plate	pounds per square inch..	36,760
net section of plate	do....	65,340
n on bearing surface of rivets	do....	84,010
rivets	do....	37,650

of joint, 66.0 per cent.

No. 7447

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.488
Plate, net sectional area	do	4.212
Plate, bearing surface of rivets	do	3.276
Rivets, shearing area	do	7.216

Applied loads.		In gauged length.		Remarks
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,488	1,000	.0	.0	Initial load.
14,976	2,000	.0001	.....	
22,464	3,000	.0002	.....	
29,952	4,000	.0002	.....	
37,440	5,000	.0002	.0000	
44,928	6,000	.0004	.....	
52,416	7,000	.0028	.....	
59,904	8,000	.0043	.....	
67,392	9,000	.0049	.....	
74,880	10,000	.0056	.0049	
82,368	11,000	.0066	.....	
89,856	12,000	.0074	.....	
97,344	13,000	.0086	.....	
104,832	14,000	.0097	.....	
112,320	15,000	.0113	.0095	
119,808	16,000	.0127	.....	
127,296	17,000	.0138	.....	
134,784	18,000	.0148	.....	
142,272	19,000	.0168	.....	
149,760	20,000	.0198	.0156	
157,248	21,000	.0238	.....	
164,736	22,000	.0275	.....	
172,224	23,000	.0378	.....	
179,712	24,000	.0483	.....	
187,200	25,000	.0584	.0513	
194,688	26,000	.0690	.....	
202,176	27,000	.0825	.....	
209,664	28,000	.0965	.....	
217,152	29,000	.1140	.....	
224,640	30,000	.1365	.....	
232,128	31,000	.17	.....	
239,616	32,000	.21	.....	
247,104	33,000	.24	.....	
254,592	34,000	.28	.....	
262,080	35,000	.37	.....	
263,000	35,120	.39	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, exceedingly lamellar. Open at edges ″.20 and ″.17.

Elongation of rivet-holes, ″.52, ″.52, ″.49, ″.49, ″.52, ″.53.

Area at fracture (one section), ″.95×″.41=.3895 square inch.

Contraction, 44.5 per cent.

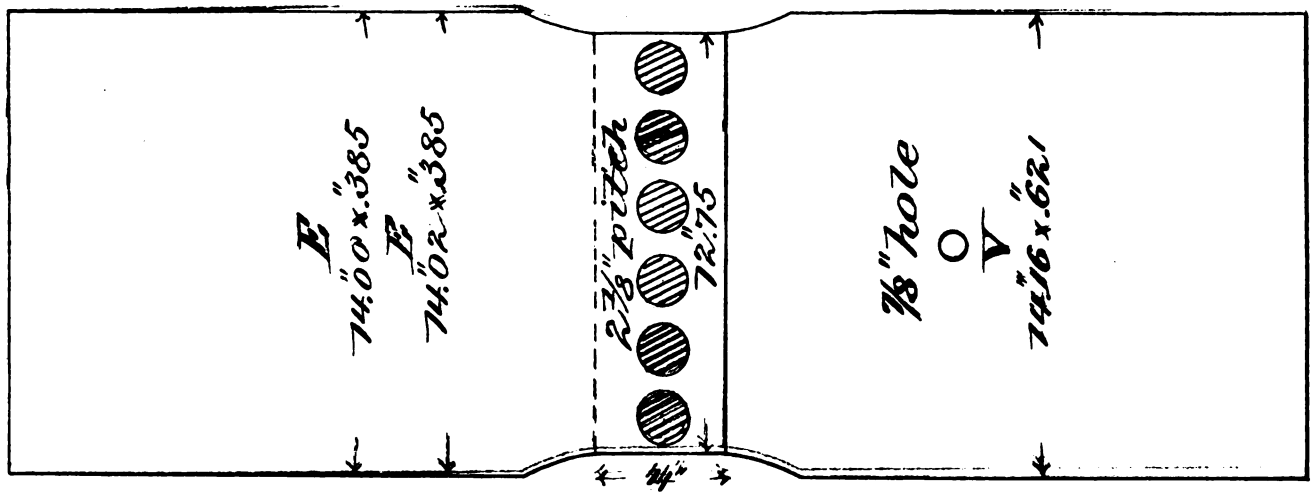
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	35,120
Tension on net section of plate	do	62,440
Compression on bearing surface of rivets	do	80,280
Shearing on rivets	do	36,440

Efficiency of joint, 63.8 per cent.

No. 1448

1/8" Steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.918
Plate, net sectional area	do	4.658
Plate, bearing surface of rivets	do	3.60
Rivets, shearing area	do	7.2.6

[Tested at temperature of 300° Fahr.]

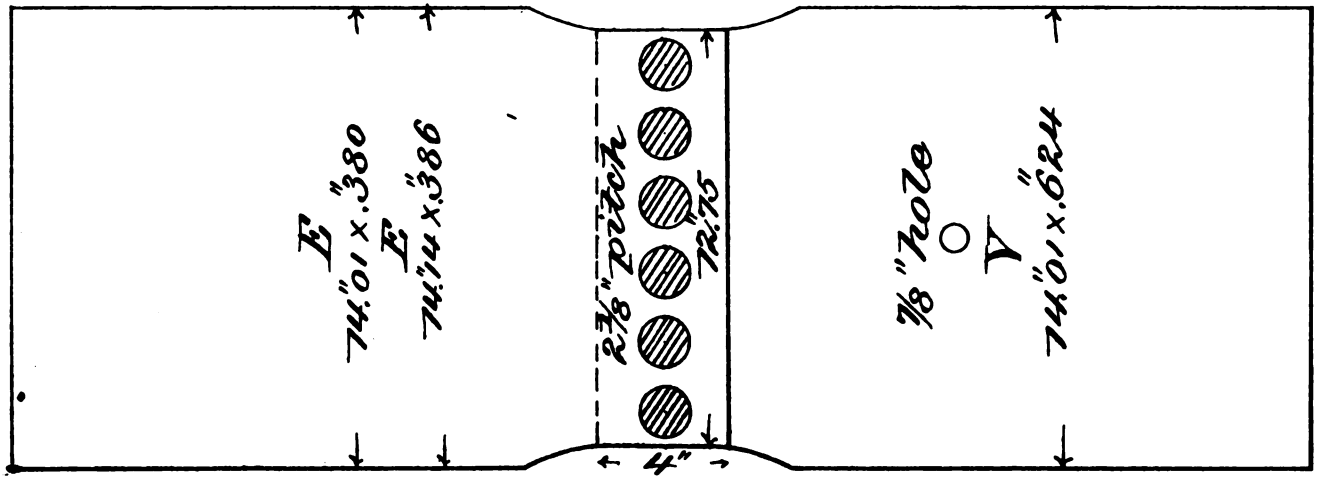
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
332, 000	41, 930	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ″.13, ″.13, ″.13, ″.13, ″.13, ″.18.

Maximum strength on joint.

Tension on gross section of plate	pounds per square inch	41, 930
Tension on net section of plate	do	71, 270
Compression on bearing surface of rivets	do	101, 840
Shearing on rivets	do	46, 010

Efficiency of joint, 76.2 per cent.



H Ex 31 49 2

Areas.

sectional area	square inches..	7.956
ctional area	do....	4.680
ıg surface of rivets	do....	3.276
ring area	do....	7.216

ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	0.	.....	
3,000	.0001	.....	
4,000	.0003	.....	
5,000	.0013	.0015	
6,000	.0023	.....	
7,000	.0031	.....	
8,000	.0036	.....	
9,000	.0042	.....	
10,000	.0050	.0048	
11,000	.0071	.....	
12,000	.0086	.....	
13,000	.0091	.....	
14,000	.0103	.....	
15,000	.0115	.0094	
16,000	.0136	.....	
17,000	.0154	.....	
18,000	.0184	.....	
19,000	.0214	.....	
20,000	.0258	.0204	
21,000	.0294	.....	
22,000	.0322	.....	
23,000	.0350	.....	
24,000	.0396	.....	
25,000	.0472	.0410	
26,000	.0583	.....	
27,000	.0692	.....	
28,000	.0825	.....	
29,000	.0974	.....	
30,000	.1160	.....	
31,000	.125	.....	
32,000	.16	.....	
33,000	.19	.....	
34,000	.22	.....	
35,000	.26	.....	
36,000	.31	.....	
36,800	.39	.....	Tensile strength.

ed the rivets.

ation of rivet-holes, ".20, ".19, ".18, ".21, ".24, ".25.

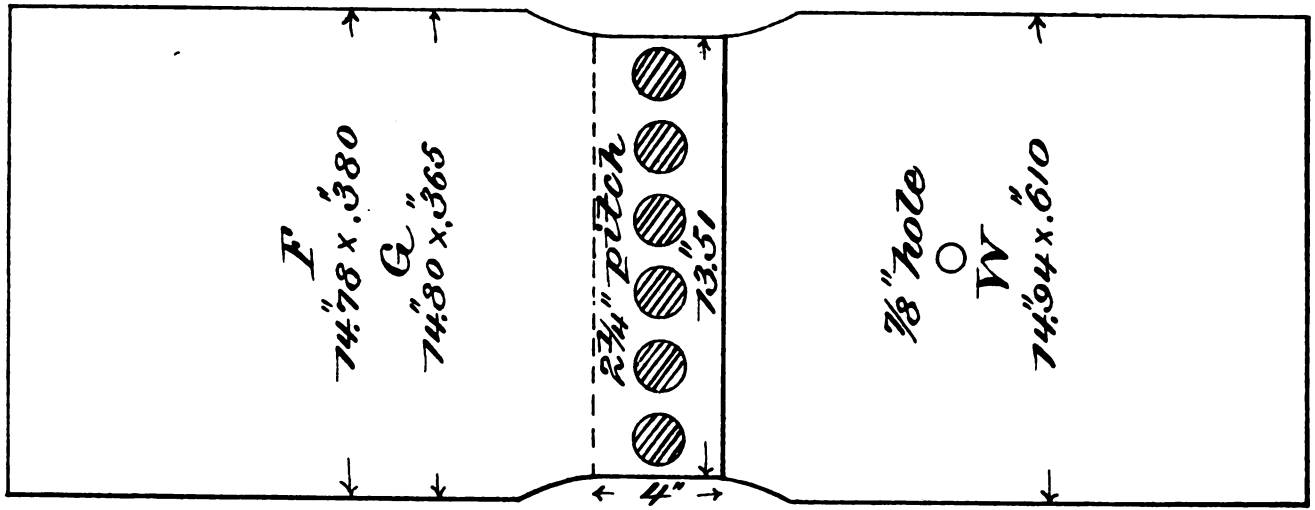
Maximum stress on joint.

ı gross section of plate	pounds per square inch..	36,800
ı net section of plate	do....	62,560
on on bearing surface of rivets	do....	89,370
ın rivets	do....	40,570

:y of joint, 66.9 per cent.

No. 7450

5/8" steel plate



H Ex 31 49 2

Areas.

ate, gross sectional area	square inches..	8.241
ate, net sectional area	do....	5.039
ate, bearing surface of rivets	do....	3.202
rets, shearing area	do....	7.216

[Tested at temperature of 400° Fahr.]

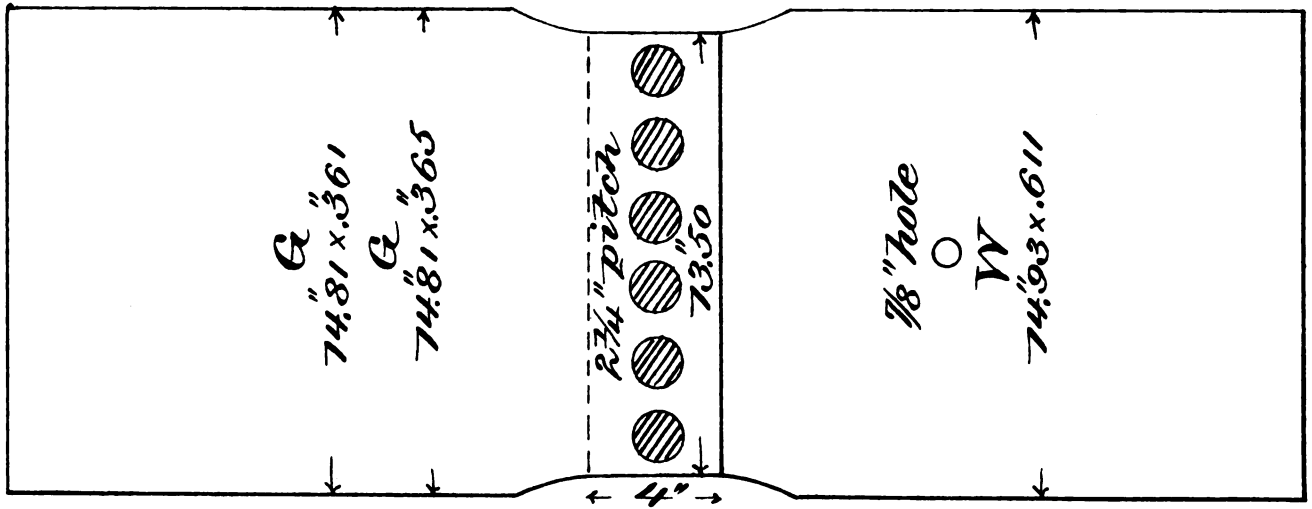
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
324,000	39,320	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ″.08 each.

Maximum stress on joint.

nsion on gross section of plate	pounds per square inch..	39,320
nsion on net section of plate	do....	64,290
mpression on bearing surface of rivets	do....	101,180
earing on rivets	do....	44,900

Efficiency of joint, 68.6 per cent.



H Ex 31 49 2

Areas.

ross sectional area	square inches..	8.249
et sectional area	do....	5.042
earing surface of rivets	do....	3.207
shearing area	do....	7.216

[Tested at temperature of 600° Fahr.]

pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
00	36,850	.....	.....	Tensile strength.

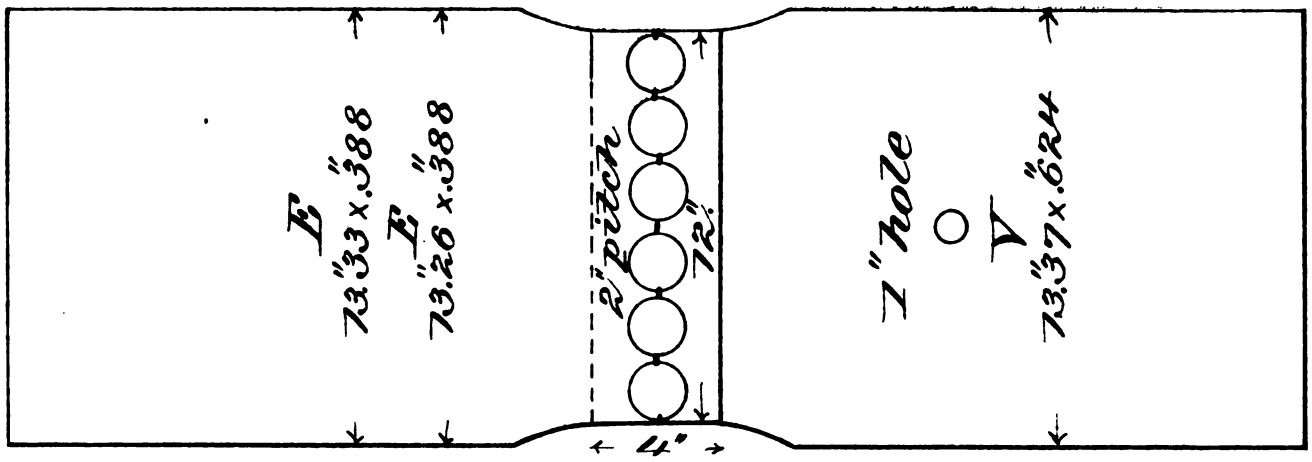
ared the rivets.
ngation of rivet-holes, ″.12 each.

Maximum stress on joint.

on gross section of plate	pounds per square inch..	36,850
on net section of plate	do....	60,290
sion on bearing surface of rivets	do....	94,790
on rivets	do....	42,130

acy of joint, 64.3 per cent.

No. 7452 5/8" steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches	7.488
Plate, net sectional area	do	3.744
Plate, bearing surface of rivets	do	3.744
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,488	1,000	0.	0.	Initial load.
14,976	2,000	.0001	.....	
22,464	3,000	.0003	.....	
29,952	4,000	.0004	.....	
37,440	5,000	.0006	.0002	
44,928	6,000	.0010	.....	
52,416	7,000	.0040	.....	
59,904	8,000	.0050	.....	
67,392	9,000	.0057	.....	
74,880	10,000	.0064	.0055	
82,368	11,000	.0073	.....	
89,856	12,000	.0082	.....	
97,344	13,000	.0093	.....	
104,832	14,000	.0107	.....	
112,320	15,000	.0118	.0101	
119,808	16,000	.0128	.....	
127,296	17,000	.0138	.....	
134,784	18,000	.0147	.....	
142,272	19,000	.0160	.....	
149,760	20,000	.0180	.0141	
157,248	21,000	.0212	.....	
164,736	22,000	.0249	.....	
172,224	23,000	.0309	.....	
179,712	24,000	.0375	.....	
187,200	25,000	.0467	.0398	
194,688	26,000	.0587	.....	
202,176	27,000	.0712	.....	
209,664	28,000	.0892	.....	
217,152	29,000	.1157	.....	
224,640	30,000	.1397	.1295	
232,128	31,000	.20	.....	
239,616	32,000	.27	.....	
240,200	32,080	.31	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar.
Elongation of rivet-holes, ″.43, ″.43, ″.41, ″.41, ″.41, ″.42.
Area at fracture (one section), ″.83×″.40=.3320 square inch.
Contraction, 46.7 per cent.

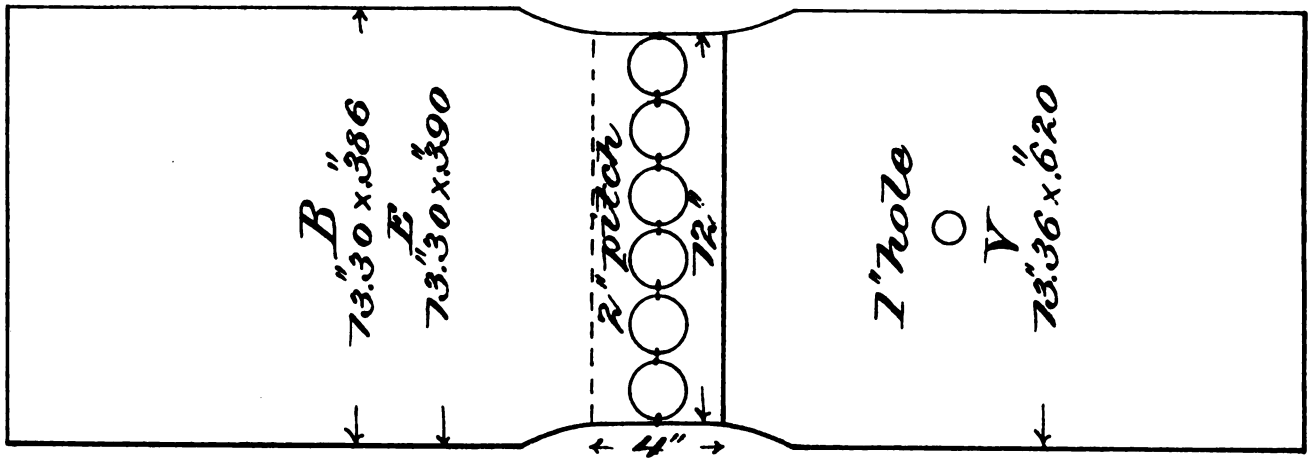
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	32,080
Tension on net section of plate	do	64,150
Compression on bearing surface of plate	do	64,150
Shearing on rivets	do	25,480

Efficiency of joint, 58.3 per cent.

No. 7453

⅛ Steel plate



H Ex 31 49 2

Areas.

oss sectional area	square inches	7.440
t sectional area	do	3.720
aring surface of rivets	do	3.720
hearing area	do	9.425

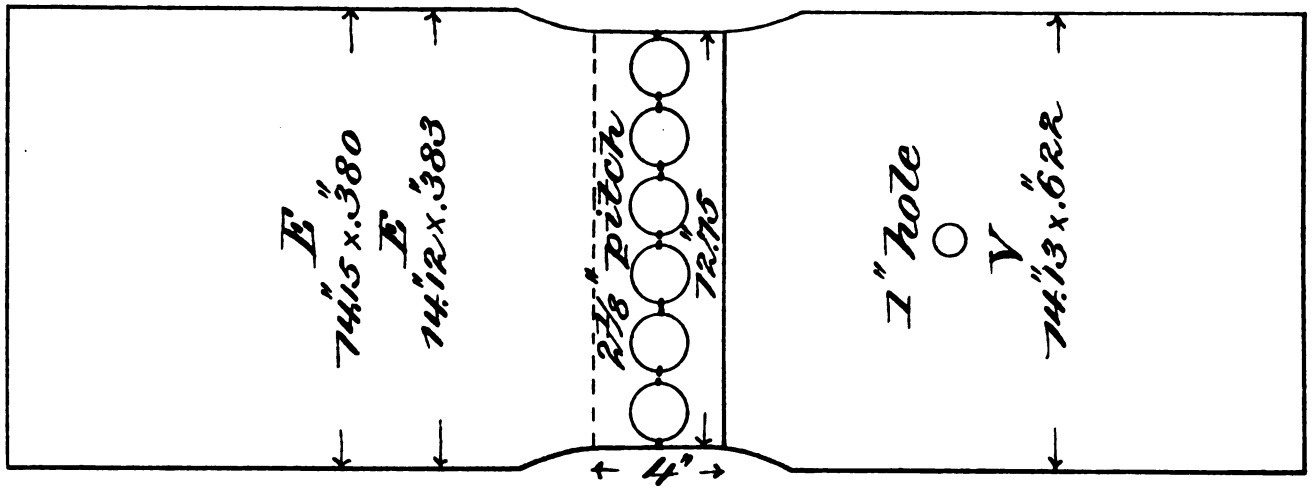
plied loads.		In ganged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
40	1,000	0.	0.	Initial load.
80	2,000	—.0001	.....	
20	3,000	—.0001	.....	
60	4,000	.0002	.....	
00	5,000	.0003	—.0002	
40	6,000	.0013	.....	
80	7,000	.0039	.....	
20	8,000	.0048	.....	
60	9,000	.0057	.....	
00	10,000	.0069	.0055	
40	11,000	.0090	.....	
80	12,000	.0095	.....	
20	13,000	.0103	.....	
60	14,000	.0121	.....	
00	15,000	.0134	.0105	
40	16,000	.0148	.....	
80	17,000	.0158	.....	
20	18,000	.0173	.....	
60	19,000	.0182	.....	
00	20,000	.0200	.0155	
40	21,000	.0227	.....	
80	22,000	.0285	.....	
20	23,000	.0365	.....	
60	24,000	.0438	.....	
00	25,000	.0520	.0445	
40	26,000	.0640	.....	
80	27,000	.0760	.....	
20	28,000	.0905	.....	
60	29,000	.1117	.....	
00	30,000	.14	.....	
40	31,000	.19	.....	
80	32,000	.27	.....	
00	32,060	.32	.....	Tensile strength.

ctured plate along line of riveting.
pearance, silky, very lamellar. Open at edges ″.03 each.
ngation of rivet-holes, ″.43, ″.43, ″.43, ″.43, ″.43, ″.46.
a at fracture (one section), ″.84×″.41=.3444 square inch.
traction, 44.4 per cent.

Maximum stress on joint.

on gross section of plate	pounds per square inch	32,060
on net section of plate	do	64,110
ssion on bearing surface of rivets	do	64,110
g on rivets	do	25,300

ency of joint, 58.3 per cent.



H Ex 31 49 2

Areas.

;ross sectional area	square inches	7.931
ıet sectional area	do	4.199
ɔearing surface of rivets	do	3.732
shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
ıtal.	Per square inch.	Elongation.	Set.	
unds.	*Pounds.*	*Inch.*	*Inch.*	
,931	1,000	0.	0.	Initial load.
,862	2,000	.0001	.....	
,793	3,000	.0006	.....	
,724	4,000	.0008	.0005	
,655	5,000	.0013	.....	
,586	6,000	.0015	.....	
,517	7,000	.0060	.....	
,448	8,000	.0070	.....	
.379	9,000	.0078	.0067	
.310	10,000	.0086	.....	
.241	11,000	.0100	.....	
172	12,000	.0108	.....	
103	13,000	.0117	.....	
034	14,000	.0127	.0108	
965	15,000	.0127	.0108	
896	16,000	.0141	.....	
827	17,000	.0151	.....	
758	18,000	.0163	.....	
689	19,000	.0177	.....	
620	20,000	.0191	.0157	
551	21,000	.0209	.....	
481	22,000	.0232	.....	
413	23,000	.0270	.....	
44	24,000	.0348	.....	
75	25,000	.0461	.0393	
06	26,000	.0590	.....	
17	27,000	.0710	.....	
68	28,000	.0900	.....	
99	29,000	.1140	.....	
30	30,000	.13	.....	
61	31,000	.17	.....	
92	32,000	.19	.....	
23	33,000	.23	.....	
54	34,000	.31	.....	
00	34,120	.36	.....	Tensile strength.

ctured plate along line of riveting.
pearance, silky, lamellar. Open at edges ″.13 and ″.10.
ngation of rivet-holes, ″.48, ″.50, ″.50, ″.52, ″.52, ″.52.
ea at fracture (one section), ″.92×″.40=.3680 square inch.
ntraction, 47.4 per cent.

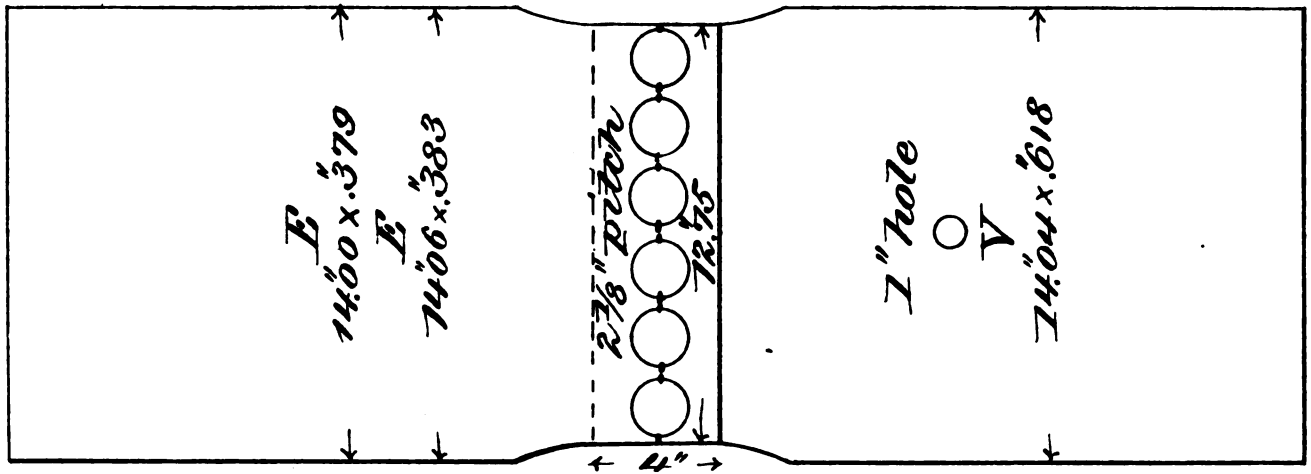
Maximum stress on joint.

ɔn on gross section of plate	pounds per square inch	34,120
ɔn on net section of plate	do	64,440
reasion on bearing surface of rivets	do	72,510
ing on rivets	do	28,710

ciency of joint, 60.0 per cent.

No. 7455

5/8" steel plate



H Ex 31 49 2

Areas.

te, gross sectional area	square inches..	7.880
te, net sectional area	do....	4.172
te, bearing surface of rivets	do....	3.708
ets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,880	1,000	0.	0.	Initial load.
15,760	2,000	.0000	.....	
23,640	3,000	—.0001	.....	
31,520	4,000	—.0002	.....	
39,400	5,000	.0000	—.0001	
47,280	6,000	+.0006	.....	
55,160	7,000	.0026	.....	
63,040	8,000	.0036	.....	
70,920	9,000	.0040	.....	
78,800	10,000	.0044	.0050	
86,680	11,000	.0062	.....	
94,560	12,000	.0068	.....	
102,440	13,000	.0075	.....	
110,320	14,000	.0082	.....	
118,200	15,000	.0100	.0104	
126,080	16,000	.0112	.....	
133,960	17,000	.0117	.....	
141,840	18,000	.0132	.....	
149,720	19,000	.0146	.....	
157,600	20,000	.0157	.0148	
165,480	21,000	.0176	.....	
173,360	22,000	.0199	.....	
181,240	23,000	.0227	.....	
189,120	24,000	.0315	.....	
197,000	25,000	.0435	.0394	
204,800	26,000	.0585	.....	
212,760	27,000	.0700	.....	
220,640	28,000	.0905	.....	
228,520	29,000	.1100	.....	
36,400	30,000	.1298	.....	
44,280	31,000	.16	.....	
52,160	32,000	.19	.....	
60,040	33,000	.24	.....	
7,920	34,000	.33	.....	Tensile strength.

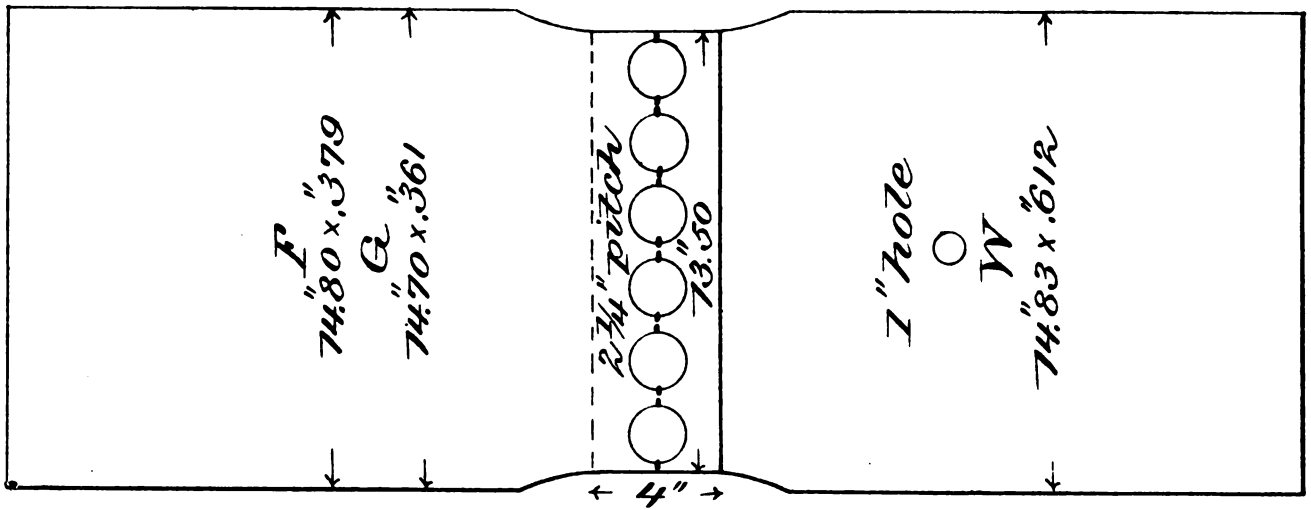
actured plate along line of riveting.
ppearance, silky, lamellar. Open at edges ″.05 each.
ongation of rivet-holes, ″.53, ″.52, ″.50, ″.50, ″.48, ″.47.
ea at fracture (one section), ″.93×″.40=.3720 square inch.
ntraction, 46.4 per cent.

Maximum stress on joint.

n gross section of plate	pounds per square inch..	34,000
n net section of plate	do....	64,220
ion on bearing surface of rivets	do....	72,250
n rivets	do....	28,420

y of joint, 61.8 per cent.

No. 7456 5/8" steel plate



H Ex 31 49 2

Areas.

s sectional area	square inches	8.262
ectional area	do	4.590
ing surface of rivets	do	3.672
aring area	do	9.425

lied loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	.0	0.	Initial load.
2,000	.0000	.....	
3,000	.0001	.....	
4,000	.0002	.....	
5,000	.0004	.0001	
6,000	.0007	.....	
7,000	.0018	.....	
8,000	.0043	.....	
9,000	.0053	.....	
10,000	.0063	.0056	
11,000	.0076	.....	
12,000	.0087	.....	
13,000	.0096	.....	
14,000	.0111	.....	
15,000	.0121	.0102	
16,000	.0136	.....	
17,000	.0151	.....	
18,000	.0160	.....	
19,000	.0175	.....	
20,000	.0183	.0146	
21,000	.0206	.....	
22,000	.0219	.....	
23,000	.0249	.....	
24,000	.0308	.....	
25,000	.0395	.0332	
26,000	.0550	.....	
27,000	.0695	.....	
28,000	.0895	.....	
29,000	.1050	.....	
30,000	.1235	.....	
31,000	.14	.....	
32,000	.17	.....	
33,000	.20	.....	
34,000	.25	.....	
35,000	.31	.....	
36,000	.38	.....	
36,490	.47	.....	Tensile strength.

ired plate along line of riveting.
rance, silky, lamellar. Open at edges ″.03 and ″.12.
ation of rivet-holes, ″.56, ″.53, ″.51, ″.51, ″.54, ″.58.
at fracture (one section), 1″.07×″.40=.4280 square inch.
action, 44.0 per cent.

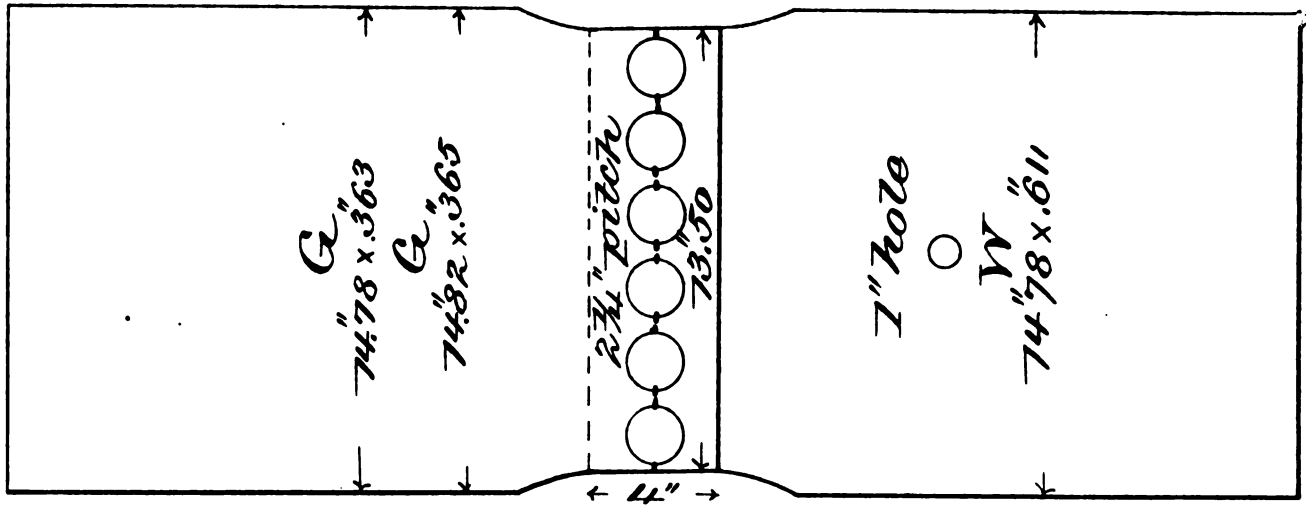
Maximum stress on joint.

gross section of plate	pounds per square inch	36,490
net section of plate	do	65,680
on bearing surface of rivets	do	82,110
rivets	do	82,000

of joint, 63.6 per cent.

No. 7457

5/8" steel plate



H Ex 31 49 2

Areas.

›ss sectional area	square inches..	8.243
t sectional area	do....	4.589
ıring surface of rivets	do....	3.666
ıearing area	do....	9.425

›plied loads.		In gauged length.		Remarks.
ı.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
19	1,000	0.	0.	Initial load.
18	2,000	—.0001	.....	
17	3,000	—.0001	.....	
16	4,000	—.0001	.....	
15	5,000	—.0001	—.0003	
14	6,000	.0000	.....	
13	7,000	.0001	.....	
12	8,000	.0019	.....	
11	9,000	.0032	.....	
10	10,000	.0037	.0038	
19	11,000	.0046	.....	
18	12,000	.0050	.....	
17	13,000	.0057	.....	
16	14,000	.0065	.....	
15	15,000	.0076	.0074	
14	16,000	.0083	.....	
13	17,000	.0100	.....	
12	18,000	.0120	.....	
11	19,000	.0129	.....	
10	20,000	.0140	.0120	
9	21,000	.0160	.....	
8	22,000	.0177	.....	
7	23,000	.0203	.....	
6	24,000	.0255	.....	
5	25,000	.0340	.0286	
4	26,000	.0435	.....	
3	27,000	.0540	.....	
2	28,000	.0705	.....	
1	29,000	.0905	.....	
0	30,000	.1090	.....	
9	31,000	.1310	.....	
8	32,000	.17	.....	
7	33,000	.21	.....	
6	34,000	.25	.....	
5	35,000	.29	.....	
4	36,000	.39	.....	
0	36,020	.42	.....	Tensile strength.

›tured plate along line of riveting.
›earance, silky. Open at edges ″.20 and ″.13.
ıgation of rivet-holes, ″.55, ″.54, ″.53, ″.53, ″.53, ″.53.
› at fracture (one section), 1″.05×″.39=.4095 square inch.
traction, 46.3 per cent.

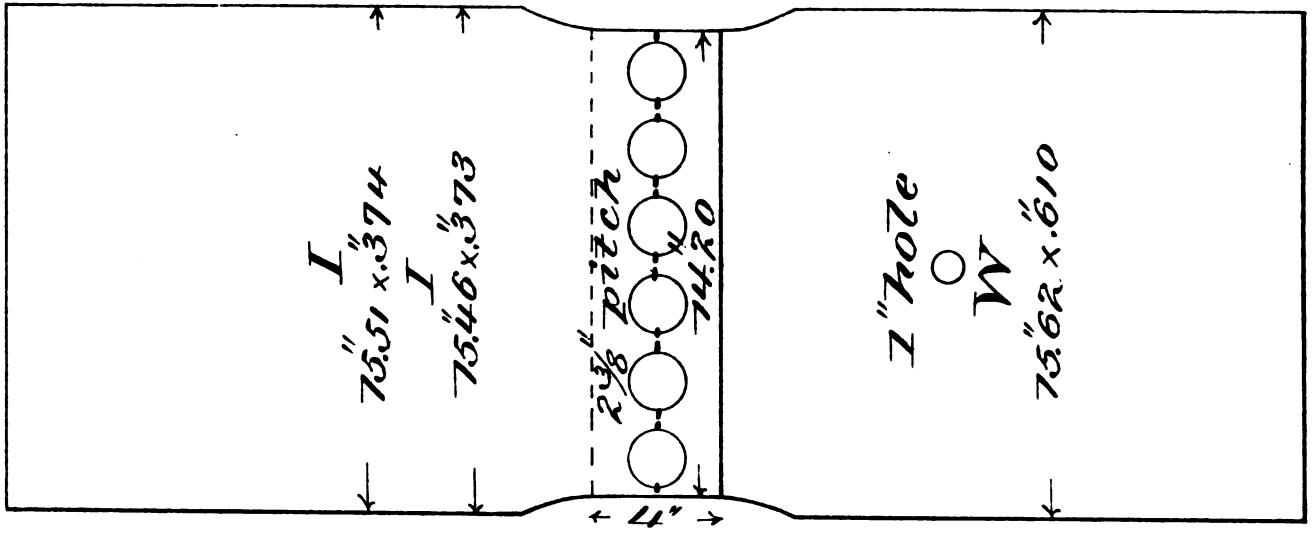
Maximum stress on joint.

›n gross section of plate	pounds per square inch..	36,020
›n net section of plate	do....	64,830
›ion on bearing surface of rivets	do....	81,040
on rivets	do....	31,520

›cy of joint, 52.8 per cent.

No. 7458

5/8" steel plate



H Ex 31 49 2

Areas.

s sectional area	square inches	8.662
sectional area	do	5.002
ing surface of rivets	do	3,660
aring area	do	9.425

lied loads.		In gauged length.		Remarks.
	Per square inch.	Elongation.	Set.	
v.	*Pounds.*	*Inch.*	*Inch.*	
	1,000	0.	0.	Initial load.
	2,000	—.0003	.....	
	3,000	—.0004	.....	
	4,000	—.0002	.....	
	5,000	.0000	—.0004	
	6,000	.0004	.....	
	7,000	.0021	.....	
	8,000	.0044	.....	
	9,000	.0057	.....	
	10,000	.0065	.0060	
	11,000	.0075	.....	
	12,000	.0086	.....	
	13,000	.0097	.....	
	14,000	.0105	.....	
	15,000	.0117	.0102	
	16,000	.0136	.....	
	17,000	.0150	.....	
	18,000	.0165	.....	
	19,000	.0177	.....	
	20,000	.0187	.0157	
	21,000	.0215	.....	
	22,000	.0231	.....	
	23,000	.0285	.....	
	24,000	.0369	.....	
	25,000	.0455	.....	
	26,000	.0617	.....	
	27,000	.0731	.....	
	28,000	.0896	.....	
	29,000	.1043	.....	
	30,000	.1235	.....	
	31,000	.16	.....	
	32,000	.18	.....	
	33,000	.22	.....	
	34,000	.24	.....	
	35,000	.28	.....	
	36,000	.32	.....	
	37,000	.39	.....	
	37,720	.51	.....	Tensile strength.

ured plate along line of riveting.
arance, silky, slightly lamellar. Open at edges ″.15 and ″.20.
gation of rivet-holes, ″.62, ″.58, ″.58, ″.58, ″.61, ″.65.
at fracture (one section), 1″.16×″.39=.4524 square inch.
raction, 46.6 per cent.

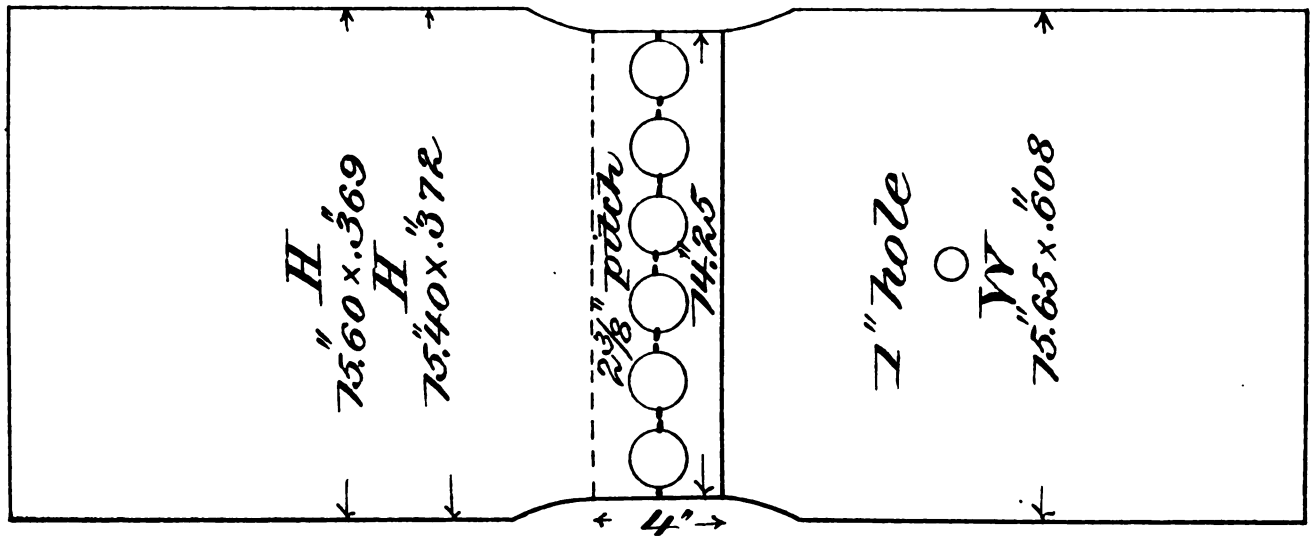
Maximum stress on joint.

gross section of plate	pounds per square inch	37,720
net section of plate	do	65,310
on on bearing surface of rivets	do	89,260
n rivets	do	38,490

y of joint, 65.8 per cent.

No. 7459

5/8" steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches	8.664
Plate, net sectional area	do	5.016
Plate, bearing surface of rivets	do	3.648
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,664	1,000	0.	0.	Initial load.
17,328	2,000	.0004	.....	
25,992	3,000	.0008	.....	
34,656	4,000	.0010	.....	
43,320	5,000	.0014	.0004	
51,984	6,000	.0020	.....	
60,648	7,000	.0040	.....	
69,112	8,000	.0054	.....	
77,976	9,000	.0071	.....	
86,640	10,000	.0084	.0062	
95,304	11,000	.0094	.....	
103,968	12,000	.0108	.....	
112,632	13,000	.0121	.....	
121,296	14,000	.0134	.....	
129,960	15,000	.0150	.0111	
138,624	16,000	.0170	.....	
147,288	17,000	.0182	.....	
155,952	18,000	.0195	.....	
164,616	19,000	.0204	.....	
173,280	20,000	.0223	.0169	
181,944	21,000	.0245	.....	
190,608	22,000	.0260	.....	
199,272	23,000	.0298	.....	
207,936	24,000	.0410	.....	
216,600	25,000	.0501	.0412	
225,264	26,000	.0640	.....	
233,928	27,000	.0783	.....	
242,592	28,000	.0940	.....	
251,256	29,000	.1100	.....	
259,920	30,000	.1320	.1200	
268,584	31,000	.17	.....	
277,248	32,000	.19	.....	
285,912	33,000	.23	.....	
294,576	34,000	.27	.....	
303,240	35,000	.31	.....	
311,904	36,000	.37	.....	
320,568	37,000	.43	.....	
325,300	37,540	.54	.....	Tensile strength.

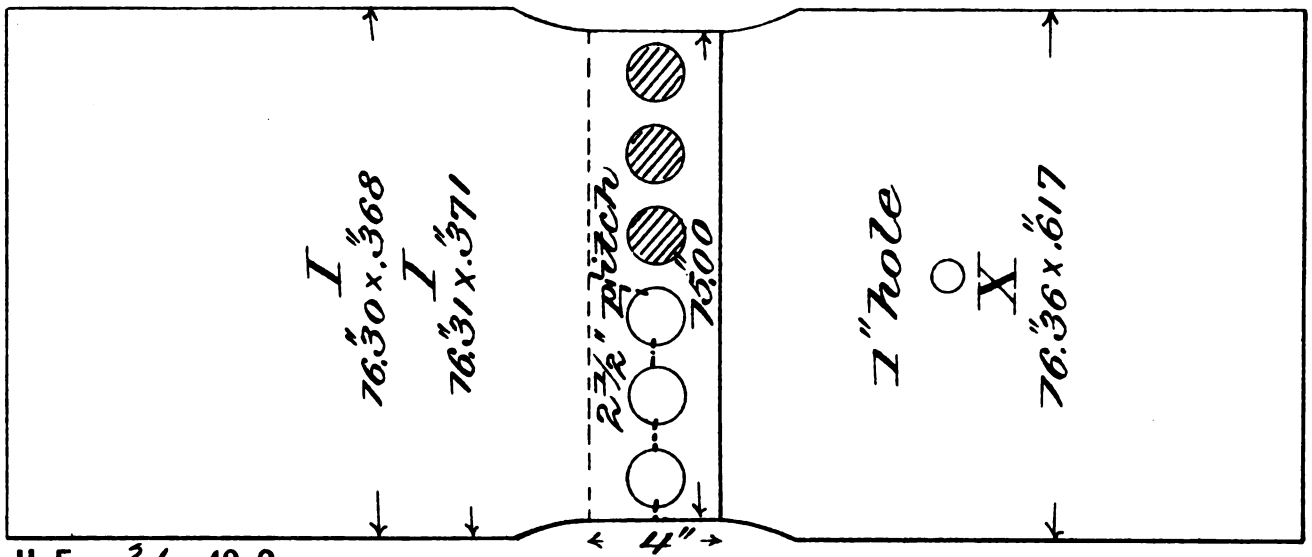
Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.10 and ″.25.
Elongation of rivet-holes, ″.56, ″.58, ″.56, ″.60, ″.65, ″.71.
Area at fracture (one section) 1″.16 × ″.41 = .4756 square inch.
Contraction, 43.1 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	37,540
Tension on net section of plate	do	64,850
Compression on bearing surface of rivets	do	89,170
Shearing on rivets	do	34,510

Efficiency of joint, 65.5 per cent.

No. 7460, 5/8" steel plate



H Ex 31 49 2

Areas.

gross sectional area	square inches..	9.255
net sectional area	do....	5.553
bearing surface of rivets	do....	3.702
, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
unds.	*Pounds.*	*Inch.*	*Inch.*	
, 255	1,000	0.	0.	Initial load.
, 510	2,000	.0001	.....	
, 765	3,000	.0003	.....	
, 020	4,000	.0005	.....	
, 275	5,000	.0007	.0003	
, 530	6,000	.0014	.....	
, 785	7,000	.0043	.....	
, 040	8,000	.0054	.....	
, 295	9,000	.0060	.....	
, 550	10,000	.0069	.0058	
, 805	11,000	.0085	.....	
, 060	12,000	.0096	.....	
, 315	13,000	.0107	.....	
, 570	14,000	.0116	.....	
, 825	15,000	.0129	.0105	
, 080	16,000	.0146	.....	
, 335	17,000	.0155	.....	
, 590	18,000	.0166	.....	
, 845	19,000	.0180	.....	
, 100	20,000	.0194	.0151	
, 355	21,000	.0210	.....	
, 610	22,000	.0223	.....	
, 865	23,000	.0262	.....	
, 120	24,000	.0380	.....	
, 375	25,000	.0570	.0476	
, 630	26,000	.0751	.....	
, 885	27,000	.0900	.....	
, 140	28,000	.1060	.....	
, 395	29,000	.1232	.....	
, 650	30,000	.135	.....	
, 905	31,000	.17	.....	
, 160	32,000	.20	.....	
, 415	33,000	.23	.....	
, 670	34,000	.28	.....	
, 925	35,000	.33	.....	
, 180	36,000	.40	.....	
, 435	37,000	.50	.....	
, 200	38,000	.57	.....	Tensile strength.

ıeared three rivets and tore plate across three sections.
ppearance, silky.
rea at fracture (one section), 1″.29×″.39=.5031 square inch.
ɔntraction, 45.6 per cent.
ongation of rivet-holes (″.34, ″.37, ″.40, sheared rivets in these s), ″.78, ″.71, ″.69.

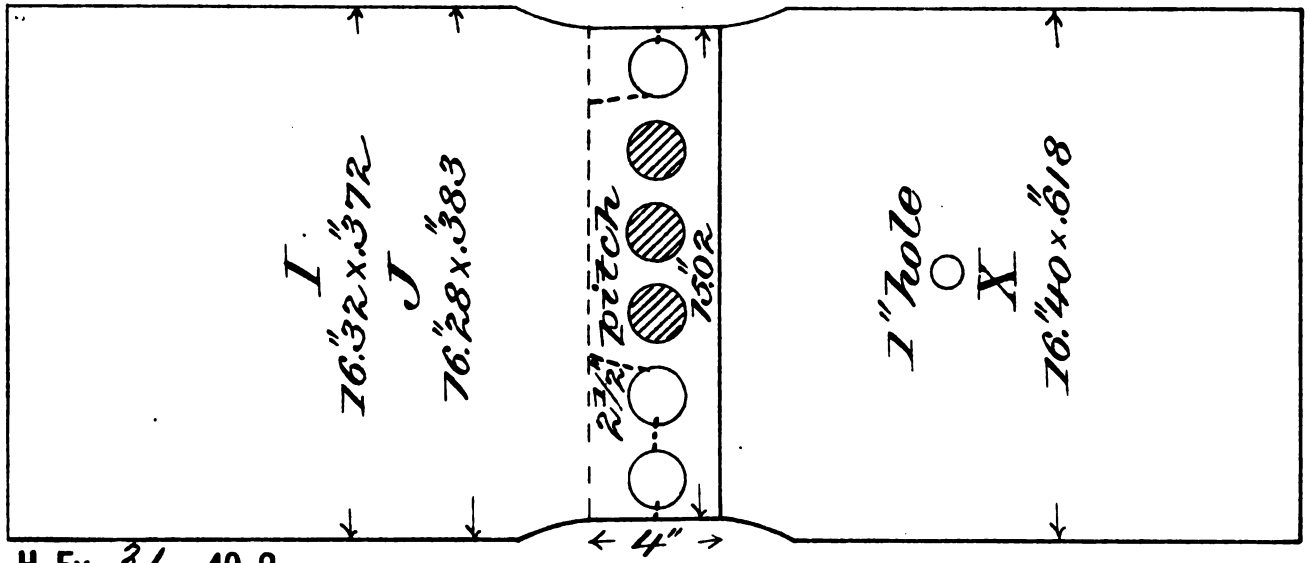
Maximum stress on joint.

ın on gross section of plate	pounds per square inch..	37,300
ın on net section of plate	do....	62,160
·ession on bearing surface of rivets	do....	93,250
ng on rivets	do....	36,630

iency of joint, 66.6 per cent.

No. 7461

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.282
Plate, net sectional area	do	5.574
Plate, bearing surface of rivets	do	3.708
Rivets, shearing area	do	9.425

Applied loads.		In ganged ength.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,282	1,000	0.	0.	Initial load.
18,564	2,000	.0002	.....	
27,846	3,000	.0003	.....	
37,128	4,000	.0005	.....	
46,410	5,000	.0010	.....	
55,692	6,000	.0024	.....	
64,974	7,000	.0056	.....	
74,256	8,000	.0078	.....	
83,538	9,000	.0089	.....	
92,820	10,000	.0100	.0090	
102,102	11,000	.0120	.....	
111,384	12,000	.0133	.....	
120,666	13,000	.0144	.....	
129,948	14,000	.0154	.....	
139,230	15,000	.0164	.0136	
148,512	16,000	.0179	.....	
157,794	17,000	.0193	.....	
167,076	18,000	.0212	.....	
176,358	19,000	.0230	.....	
185,640	20,000	.0245	.0197	
194,922	21,000	.0277	.....	
204,204	22,000	.0314	.....	
213,486	23,000	.0412	.....	
222,768	24,000	.0513	.....	
232,050	25,000	.0612	.0529	
241,332	26,000	.0770	.....	
250,614	27,000	.0895	.....	
259,896	28,000	.1058	.....	
269,178	29,000	.1280	.....	
278,460	30,000	.16	.....	
287,742	31,000	.19	.....	
297,024	32,000	.22	.....	
306,306	33,000	.26	.....	
315,588	34,000	.30	.....	
324,870	35,000	.36	.....	
334,152	36,000	.42	.....	
343,434	37,000	.52	.....	Tensile strength.

Sheared three rivets and fractured three sections of plate.

Appearance, silky.

Area at fracture (one section), 1″.22×″.36=.4392 square inch.

Contraction, 52.6 per cent.

Elongation of rivet-holes (″.44, ″.35, ″.30; sheared rivets in these holes), ″.78, ″.75.

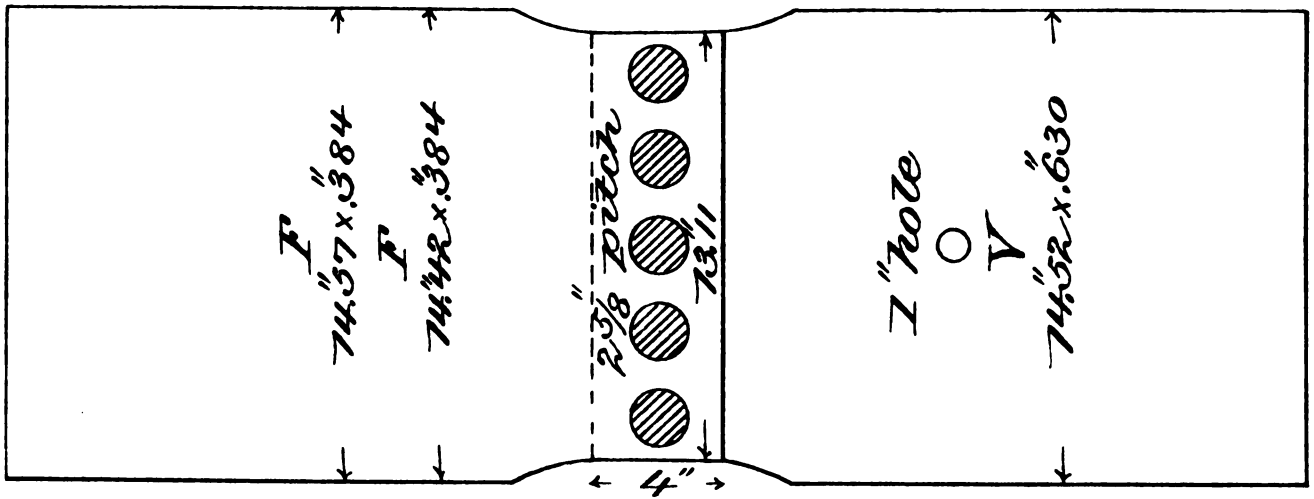
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	37,000
Tension on net section of plate	do	61,610
Compression on bearing surface of rivets	do	92,620
Shearing on rivets	do	36,440

Efficiency of joint, 66.1 per cent.

No. 7462

5/8" steel plate



H Ex 3/ 49 2

Areas.

Plate, gross sectional area	square inches	8.259
Plate, net sectional area	do	5.109
Plate, bearing surface of rivets	do	3.150
Rivets, shearing area	do	7.854

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,259	1,000	0.	0.	Initial load.
16,518	2,000	.0002	.....	
24,777	3,000	.0005	.....	
33,036	4,000	.0005	.....	
41,295	5,000	.0007	.0004	
49,554	6,000	.0035	.....	
57,813	7,000	.0050	.....	
66,072	8,000	.0061	.....	
74,331	9,000	.0087	.....	
82,590	10,000	.0115	.0101	
90,849	11,000	.0125	.....	
99,108	12,000	.0133	.....	
107,367	13,000	.0145	.....	
115,626	14,000	.0160	.....	
123,885	15,000	.0175	.0148	
132,144	16,000	.0200	.....	
140,403	17,000	.0222	.....	
148,662	18,000	.0254	.....	
156,921	19,000	.0269	.....	
165,180	20,000	.0289	.0237	
173,439	21,000	.0320	.....	
181,698	22,000	.0360	.....	
189,957	23,000	.0467	.....	
198,216	24,000	.0610	.....	
206,475	25,000	.0726	.0650	
214,734	26,000	.0915	.....	
222,993	27,000	.1060	.....	
231,252	28,000	.1220	.....	
239,511	29,000	.16	.....	
247,770	30,000	.18	.....	
256,029	31,000	.21	.....	
264,288	32,000	.24	.....	
272,547	33,000	.29	.....	
280,806	34,000	.33	.....	
289,065	35,000	.40	.....	
295,500	35,780	.45	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ″.31, ″.30, ″.26, ″.25, ″.24.

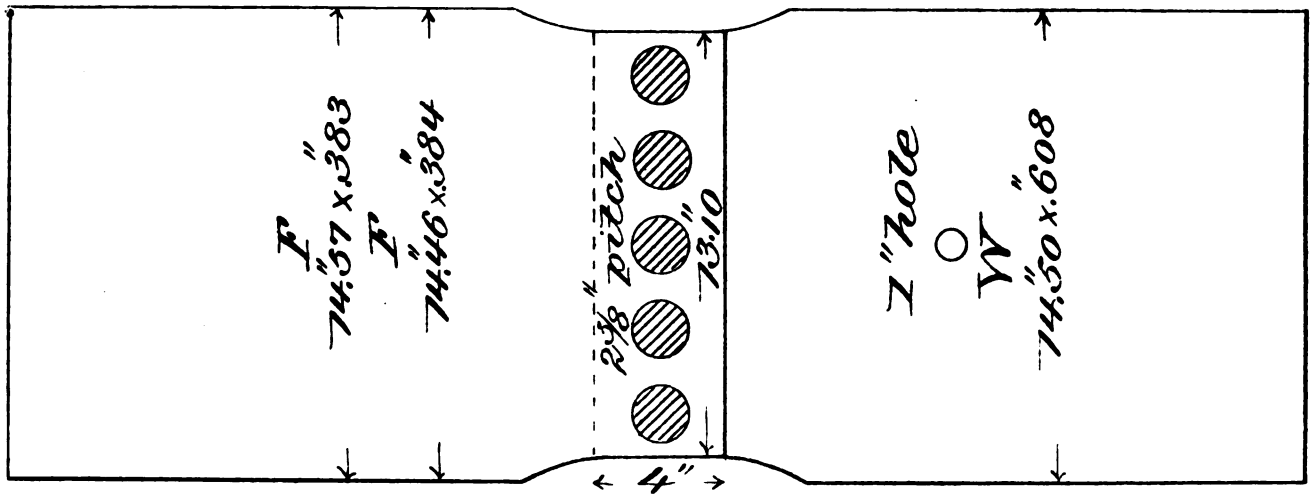
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	35,780
Tension on net section of plate	do	57,840
Compression on bearing surface of rivets	do	93,810
Shearing on rivets	do	37,620

Efficiency of joint, 65.0 per cent.

No. 7463

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.065
Plate, net sectional area	do	4.925
Plate, bearing surface of rivets	do	3.040
Rivets, shearing area	do	7.584

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,965	1,000	0.	0.	Initial load.
15,930	2,000	−.0002	.....	
23,895	3,000	−.0003	.....	
31,860	4,000	−.0001	.....	
39,825	5,000	−.0001	−.0001	
47,790	6,000	+.0001	.....	
55,755	7,000	.0005	.....	
63,720	8,000	.0016	.....	
71,685	9,000	.0028	.....	
79,650	10,000	.0048	.0059	
87,615	11,000	.0068	.....	
95,580	12,000	.0078	.....	
103,545	13,000	.0087	.....	
111,510	14,000	.0095	.....	
119,475	15,000	.0102	.0090	
127,440	16,000	.0124	.....	
135,405	17,000	.0132	.....	
143,370	18,000	.0137	.....	
151,335	19,000	.0149	.....	
159,300	20,000	.0160	.0148	
167,265	21,000	.0190	.....	
175,230	22,000	.0211	.....	
183,195	23,000	.0275	.....	
191,160	24,000	.0293	.....	
199,125	25,000	.0542	.0523	
207,090	26,000	.0680	.....	
215,055	27,000	.0800	.....	
223,020	28,000	.0948	.....	
230,985	29,000	.1140	.....	
238,950	30,000	.1350	.....	
246,915	31,000	.16	.....	
254,880	32,000	.18	.....	
262,845	33,000	.22	.....	
270,810	34,000	.27	.....	
278,775	35,000	.32	.....	
286,740	36,000	.37	.....	
294,400	36,960	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ″.23, ″.32, ″.33, ″.26, ″.22.

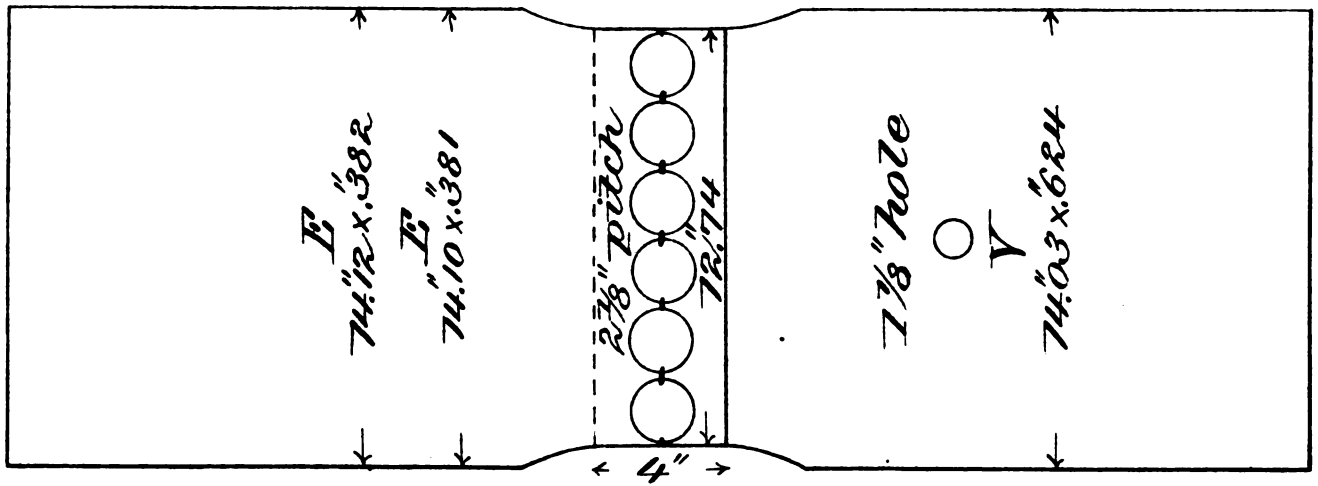
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,960
Tension on net section of plate	do	59,770
Compression on bearing surface of rivets	do	96,810
Shearing on rivets	do	37,500

Efficiency of joint, 64.5 per cent.

No. 1464

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.950
Plate, net sectional area	do	3.738
Plate, bearing surface of rivets	do	4.212
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
247,200	31,090	.32	.....	Tensile strength.

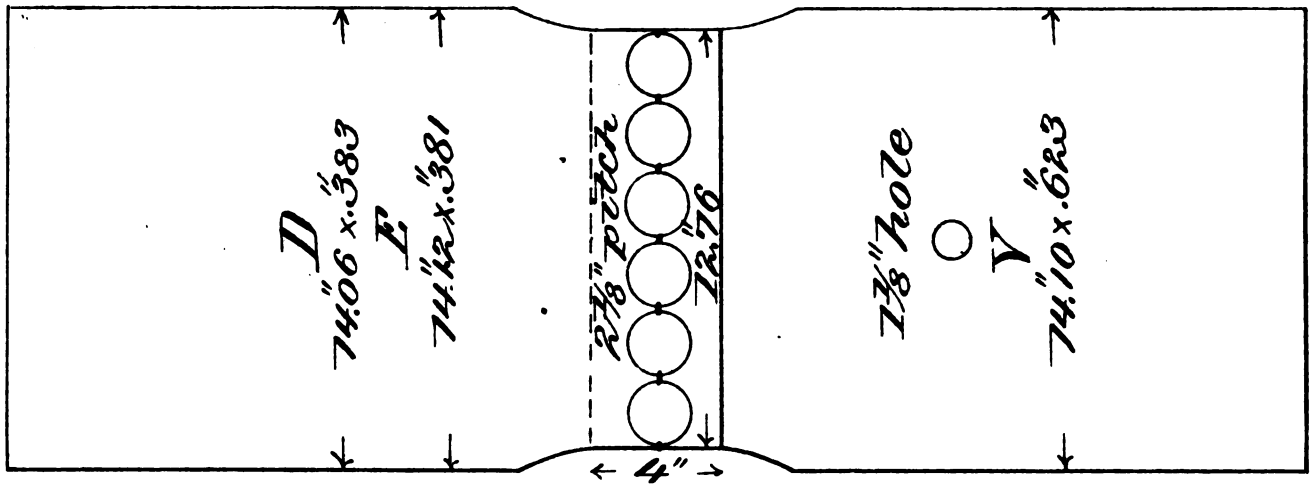
Fractured plate along line of riveting.
Appearance, silky, lamellar.
Area at fracture (one section), ″.81×″.39=.3159 square inch.
Contraction, 49.3 per cent.
Elongation of rivet-holes, ″.45 each.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	31,090
Tension on net section of plate	do	66,130
Compression on bearing surface of rivets	do	58,690
Shearing on rivets	do	20,720

Efficiency of joint, 56.5 per cent.

No. 7465 5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.949
Plate, net sectional area	do....	3.744
Plate, bearing surface of rivets	do....	4.205
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,949	1,000	0.	0.	Initial load.
15,898	2,000	.0002	.....	
23,847	3,000	.0004	.....	
31,796	4,000	.0006	.....	
39,745	5,000	.0010	.0007	
47,694	6,000	.0032	.....	
55,643	7,000	.0045	.....	
63,592	8,000	.0055	.....	
71,541	9,000	.0062	.....	
79,490	10,000	.0080	.0064	
87,439	11,000	.0095	.....	
95,388	12,000	.0099	.....	
103,337	13,000	.0110	.....	
111,286	14,000	.0120	.....	
119,235	15,000	.0130	.0108	
127,184	16,000	.0151	.....	
247,200	31,090	.....	.....	Tensile strength.

Fractured plate along line of riveting. Open at edges ″.03 each. Elongation of rivet-holes, ″.42, ″.42, ″.43, ″.44, ″.44, ″.44.

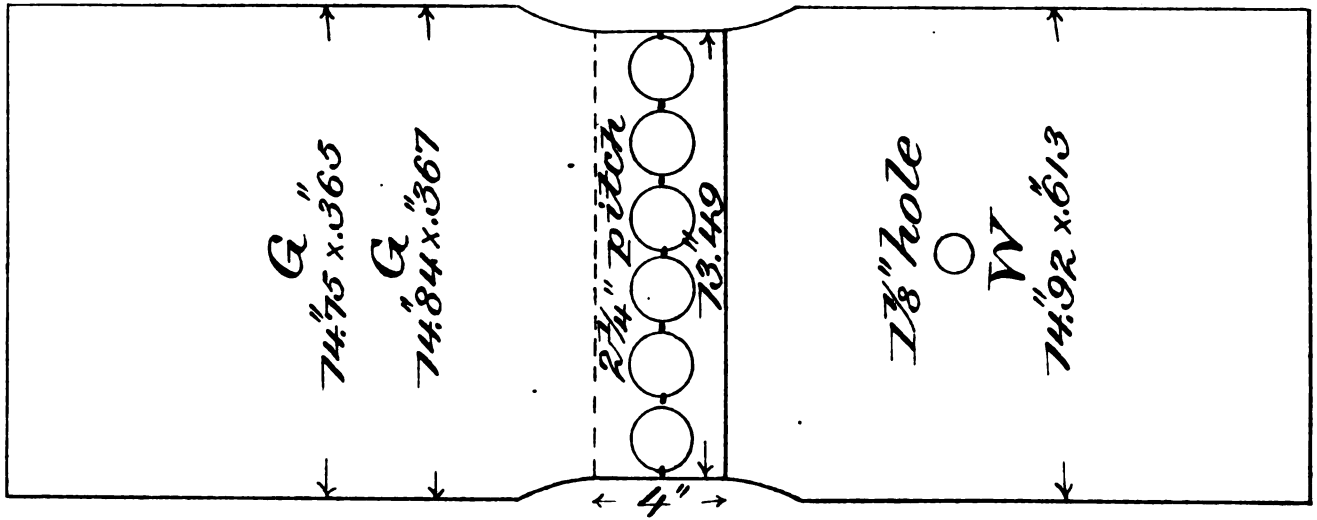
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	31,090
Tension on net section of plate	do....	66,020
Compression on bearing surface of rivets	do....	58,780
Shearing on rivets	do....	20,720

Efficiency of joint, 56.5 per cent.

No. 7466

5/8" steel plate



H Ex 31 49 2

Areas.

oss sectional area	square inches..	8.269
t sectional area	do....	4.131
aring surface of rivets	do....	4.138
hearing area	do....	11.928

pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
69	1,000	0.	0.	Initial load.
38	2,000	.0001	.....	
07	3,000	.0002	.....	
76	4,000	.0003	.....	
45	5,000	.0005	.0002	
14	6,000	.0009	.....	
83	7,000	.0019	.....	
52	8,000	.0036	.....	
21	9,000	.0053	.....	
90	10,000	.0069	.0061	
59	11,000	.0081	.....	
28	12,000	.0095	.....	
97	13,000	.0114	.....	
66	14,000	.0122	.....	
35	15,000	.0127	.0109	
04	16,000	.0141	.....	
73	17,000	.0151	.....	
42	18,000	.0161	.....	
11	19,000	.0175	.....	
80	20,000	.0194	.0154	
49	21,000	.0231	.....	
18	22,000	.0257	.....	
87	23,000	.0332	.....	
56	24,000	.0394	.....	
25	25,000	.0555	.0417	
94	26,000	.0650	.....	
63	27,000	.0770	.....	
32	28,000	.0900	.....	
01	29,000	.1110	.....	
70	30,000	.1400	.....	
39	31,000	.17	.....	
08	32,000	.21	.....	
77	33,000	.29	.....	
00	33,150	.38	.....	Tensile strength.

ctured plate along line of riveting.
pearance, silky, slightly lamellar. Open at edges ″.03 each.
a at fracture (one section), ″.95×″.41=.3895 square inch.
traction, 43.5 per cent.
ngation of rivet-holes, ″.48, ″.48, ″.48, ″.48, ″.53, ″.53.

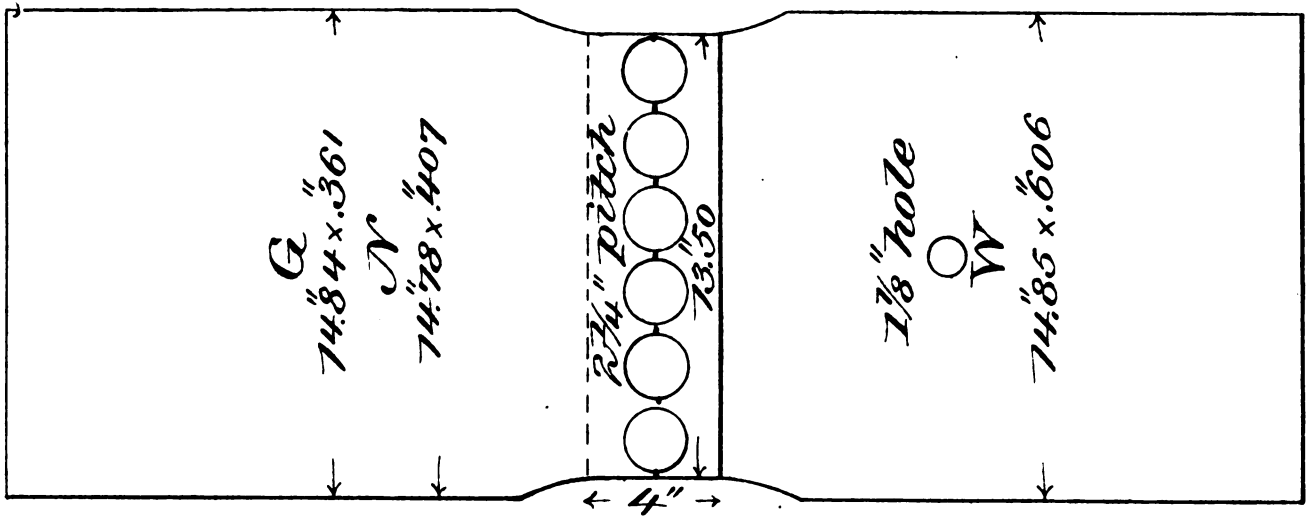
Maximum stress on joint.

on gross section of plate	pounds per square inch..	33,150
on net section of plate	do....	66,350
sion on bearing surface of rivets	do....	66,240
on rivets	do....	22,980

acy of joint, 57.8 per cent.

No. 7467

5/8" steel plate



H Ex 31 492

Areas.

ross sectional area	square inches..	8.181
et sectional area	do....	4.090
earing surface of rivets	do....	4.091
hearing area	do....	11.928

pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
81	1,000	0.	0.	Initial load.
62	2,000	.0001	.....	
43	3,000	.0003	.....	
24	4,000	.0005	.....	
05	5,000	.0009	.0005	
86	6,000	.0015	.....	
67	7,000	.0039	.....	
48	8,000	.0051	.....	
20	9,000	.0063	.....	
10	10,000	.0084	.0075	
91	11,000	.0097	.....	
72	12,000	.0105	.....	
53	13,000	.0113	.....	
34	14,000	.0123	.....	
15	15,000	.0133	.0112	
96	16,000	.0153	.....	
77	17,000	.0169	.....	
58	18,000	.0184	.....	
39	19,000	.0193	.....	
20	20,000	.0203	.0165	
01	21,000	.0230	.....	
82	22,000	.0270	.....	
63	23,000	.0350	.....	
44	24,000	.0442	.....	
25	25,000	.0535	.0471	
06	26,000	.0670	.....	
87	27,000	.0790	.....	
68	28,000	.0960	.....	
49	29,000	.1135	.....	
30	30,000	.1378	.1275	
11	31,000	.17	.....	
02	32,000	.21	.....	
73	33,000	.28	.....	
00	33,240	.34	.....	Tensile strength.

ictured plate along line of riveting.
pearance, silky, slightly lamellar. Open at edges ".15 and ".05.
ngation of rivet-holes, ".50, ".48, ".48, ".48, ".48, ".49.
ea of fracture (one section), ".93×".38=.3534 square inch.
ntraction, 48.1 per cent.

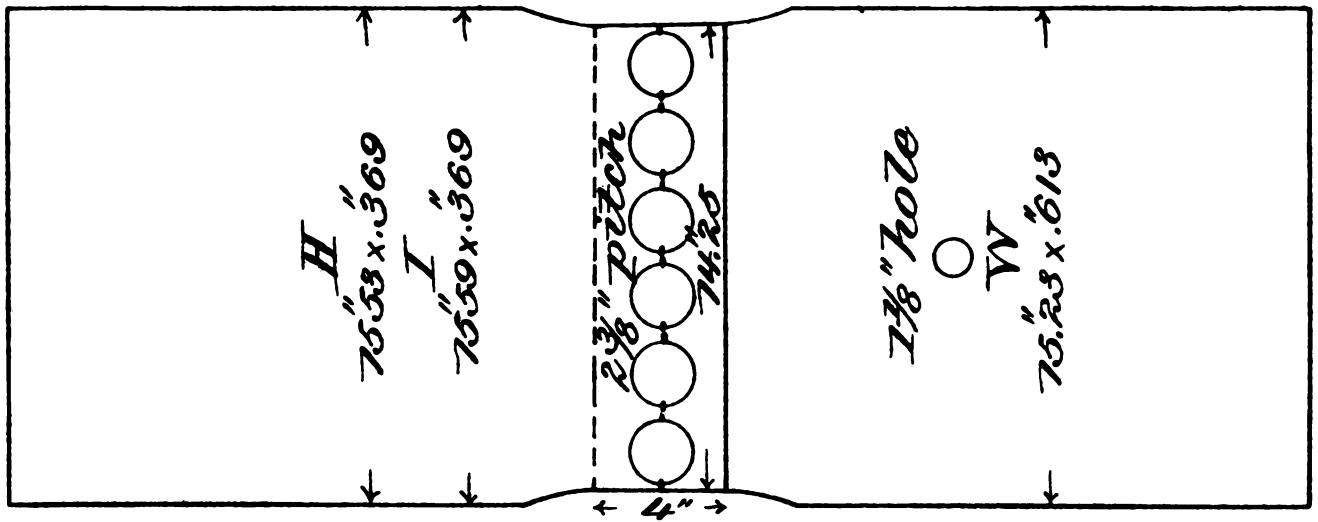
Maximum stress on joint.

on gross section of plate	pounds per square inch..	33,240
on net section of plate	do....	66,250
ssion on bearing surface of rivets	do....	66,240
g on rivets	do....	22,720

ency of joint, 58.0 per cent.

No. 7468

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	8.735
Plate, net sectional area	do	4.597
Plate, bearing surface of rivets	do	4.138
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,735	1,000	0.	0.	Initial load.
17,470	2,000	0.	.....	
26,205	3,000	.0007	.....	
34,940	4,000	.0009	.....	
43,675	5,000	.0019	.0012	
52,410	6,000	.0044	.....	
61,145	7,000	.0054	.....	
69,880	8,000	.0063	.....	
78,615	9,000	.0070	.....	
87,350	10,000	.0079	.0060	
96,085	11,000	.0090	.....	
104,820	12,000	.0107	.....	
113,555	13,000	.0131	.....	
122,290	14,000	.0146	.....	
131,025	15,000	.0159	.0121	
139,760	16,000	.0172	.....	
148,495	17,000	.0185	.....	
157,230	18,000	.0201	.....	
165,965	19,000	.0226	.....	
174,700	20,000	.0265	.0201	
183,435	21,000	.0310	.....	
192,170	22,000	.0350	.....	
200,905	23,000	.0421	.....	
209,640	24,000	.0507	.....	
218,375	25,000	.0576	.0487	
227,110	26,000	.0704	.....	
235,845	27,000	.0844	.....	
244,580	28,000	.1000	.....	
253,315	29,000	.1275	.....	
262,050	30,000	.15	.....	
270,785	31,000	.19	.....	
279,520	32,000	.23	.....	
288,255	33,000	.27	.....	
296,990	34,000	.33	.....	
299,300	35,000	.40	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ″.15 and ″.07.
Elongation of rivet-holes, ″.55, ″.55, ″.52, ″.52, ″.52, ″.54.
Area at fracture (one section), 1″.05×″.39=.4095 square inch.
Contraction, 46.5 per cent.

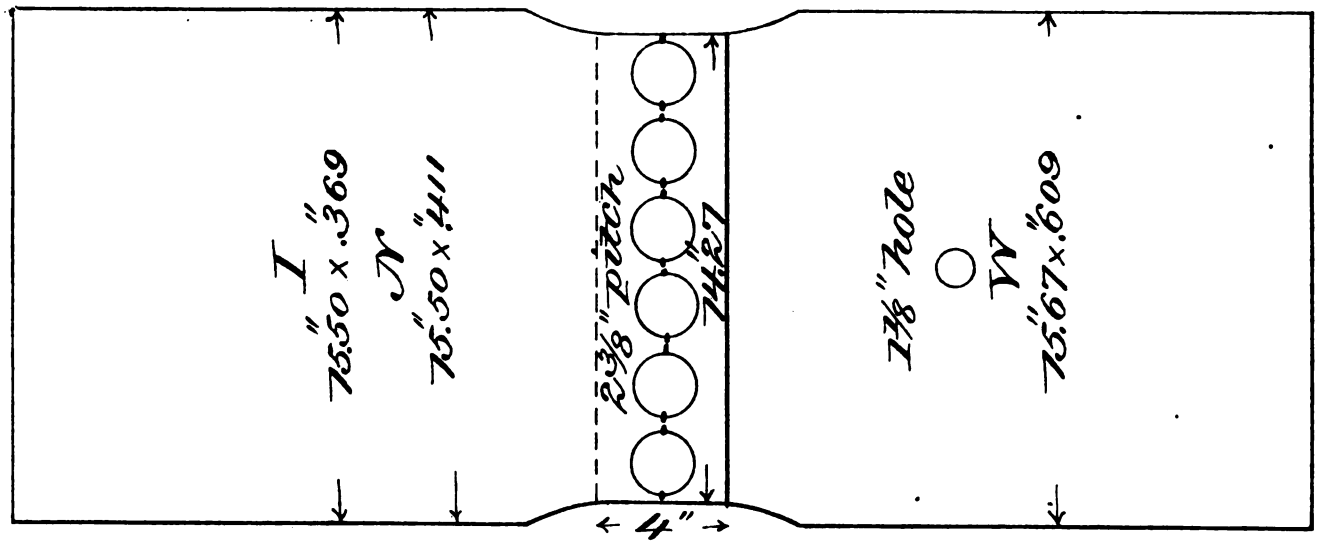
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,260
Tension on net section of plate	do	65,110
Compression on bearing surface of rivets	do	72,330
Shearing on rivets	do	25,090

Efficiency of joint, 59.8 per cent.

No. 7469

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.690
Plate, net sectional area	do....	4.579
Plate, bearing surface of rivets	do....	4.111
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,690	1,000	0.	0.	Initial load.
17,380	2,000	.0002	.....	
26,070	3,000	.0003	.....	
34,760	4,000	.0005	.....	
43,450	5,000	.0007	.0003	
52,140	6,000	.0011	.....	
60,830	7,000	.0017	.....	
69,520	8,000	.0025	.....	
78,210	9,000	.0035	.....	
86,900	10,000	.0054	.0042	
95,590	11,000	.0070	.....	
104,280	12,000	.0082	.....	
112,970	13,000	.0092	.....	
121,660	14,000	.0104	.....	
130,350	15,000	.0113	.0084	
139,040	16,000	.0127	.....	
147,730	17,000	.0135	.....	
156,420	18,000	.0145	.....	
165,110	19,000	.0160	.....	
173,800	20,000	.0183	.0134	
182,490	21,000	.0224	.....	
191,180	22,000	.0253	.....	
199,870	23,000	.0300	.....	
208,560	24,000	.0355	.....	
217,250	25,000	.0435	.0360	
225,940	26,000	.0548	.....	
234,630	27,000	.0652	.....	
243,320	28,000	.0795	.....	
252,010	29,000	.0980	.....	
260,700	30,000	.1185	.1069	
269,390	31,000	.13	.....	
278,080	32,000	.17	.....	
286,770	33,000	.20	.....	
295,460	34,000	.24	.....	
302,350	34,790	.34	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.15 and ″.05.
Elongation of rivet-holes, ″.65, ″.60, ″.56, ″.52, ″.50, ″.50.
Area at fracture (one section), 1″.06×″.38=.4028 square inch.
Contraction, 47.0 per cent.

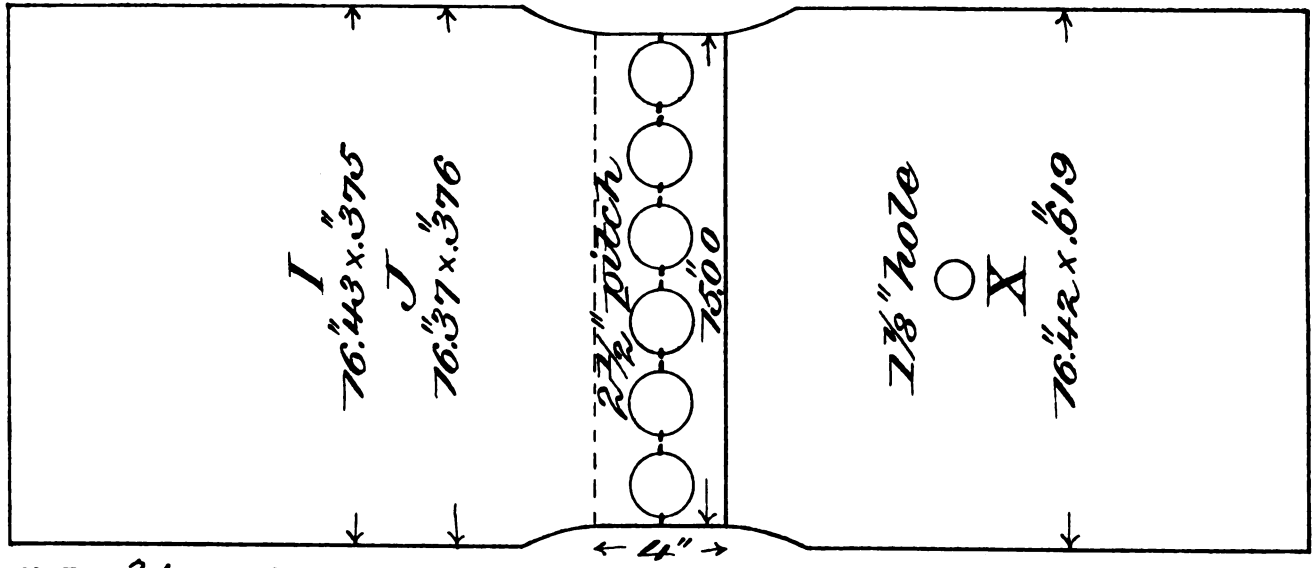
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,790
Tension on net section of plate	do....	66,030
Compression on bearing surface of rivets	do....	73,540
Shearing on rivets	do....	25,350

Efficiency of joint, 60.7 per cent.

No. 7470

5/8" steel plate



H Ex 31 49 2

Areas.

ıss sectional area	square inches..	9.285
, sectional area	do....	5.107
ıring surface of rivets	do....	4.178
ıearing area	do....	11,928

›plied loads.		In gauged length.		Remarks.
l.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
35	1,000	0.	0.	Initial load.
10	2,000	.0000	.....	
15	3,000	.0002	.....	
10	4,000	.0004	.....	
25	5,000	.0008	.0005	
10	6,000	.0030	.....	
35	7,000	.0040	.....	
30	8,000	.0054	.....	
15	9,000	.0082	.....	
50	10,000	.0090	.0085	
15	11,000	.0100	.....	
50	12,000	.0110	.....	
15	13,000	.0116	.....	
00	14,000	.0126	.....	
75	15,000	.0137	.0119	
50	16,000	.0146	.....	
15	17,000	.0161	.....	
50	18,000	.0173	.....	
5	19,000	.0189	.....	
00	20,000	.0202	.0169	
15	21,000	.0233	.....	
0	22,000	.0263	.....	
5	23,000	.0295	.....	
0	24,000	.0345	.....	
5	25,000	.0468	.0414	
0	26,000	.0663	.....	
5	27,000	.0783	.....	
0	28,000	.0938	.....	
5	29,000	.1123	.....	
0	30,000	.1373	.....	
5	31,000	.17	.....	
0	32,000	.20	.....	
5	33,000	.24	.....	
0	34,000	.29	.....	
0	34,980	.41	.....	Tensile strength.

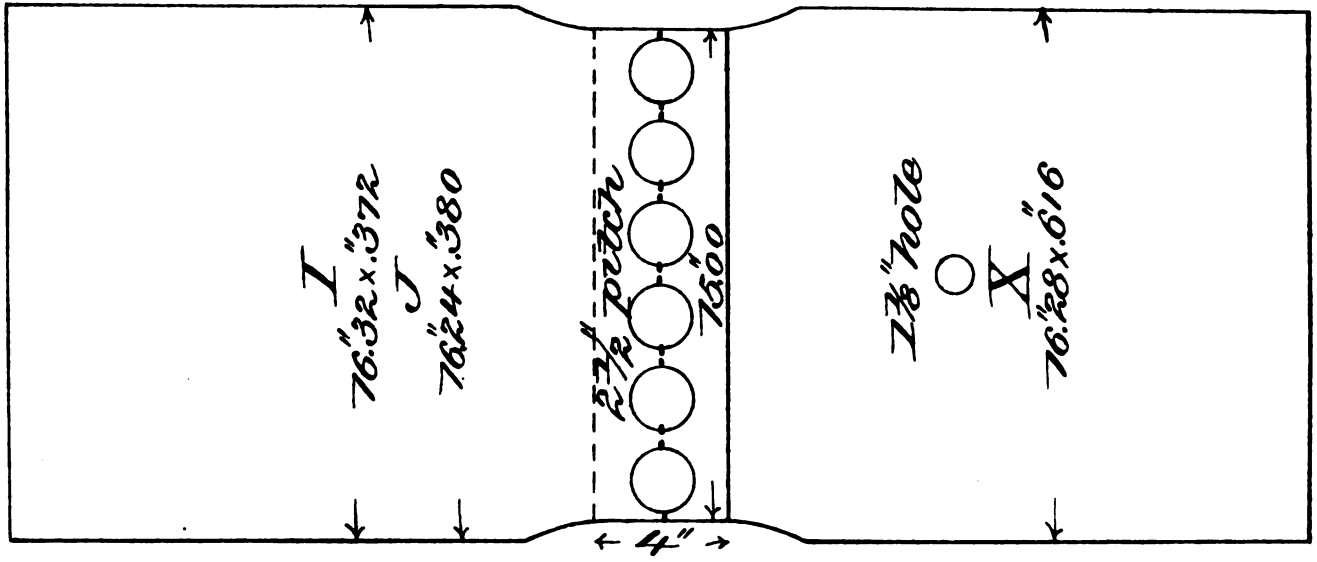
tured plate along line of riveting.
earance, silky. Open at edges ″.25 and ″.10.
gation of rivet-holes, ″.68, ″.62, ″.56, ″.53, ″.53, ″.54.
› at fracture (one section), 1″.20×″.41=.4920 square inch.
:raction, 42.1 per cent.

Maximum stress on joint.

›n gross section of plate	pounds per square inch..	34,980
›n net section of plate	do....	63,600
›ion on bearing surface of rivets	do....	77,740
on rivets	do....	27,230

cy of joint, 62.5 per cent.

No. 7471 5/8" steel plate



H Ex 31 49 2

Areas.

oss sectional area	square inches..	9.240
t sectional area	do....	5.082
aring surface of rivets	do....	4.158
hearing area	do....	11.928

plied loads.		In gauged length.		Remarks.
l.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	Initial load.
0	2,000	.0001	.....	
0	3,000	.0002	.....	
0	4,000	.0005	.....	
0	5,000	.0009	.0006	
0	6,000	.0031	.....	
0	7,000	.0051	.....	
0	8,000	.0076	.....	
0	9,000	.0086	.....	
0	10,000	.0100	.0088	
0	11,000	.0113	.....	
0	12,000	.0123	.....	
0	13,000	.0133	.....	
0	14,000	.0145	.....	
0	15,000	.0161	.0131	
0	16,000	.0176	.....	
0	17,000	.0190	.....	
0	18,000	.0207	.....	
0	19,000	.0228	.....	
0	20,000	.0250	.0199	
0	21,000	.0292	.....	
0	22,000	.0338	.....	
0	23,000	.0400	.....	
0	24,000	.0490	.....	
0	25,000	.0620	.0537	
0	26,000	.0753	.....	
0	27,000	.....	.....	
0	28,000	.1095	.....	
0	29,000	.14	.....	
0	30,000	.16	.....	
0	31,000	.19	.....	
0	32,000	.23	.....	
0	33,000	.28	.....	
0	34,000	.32	.....	
0	34,770	.46	.....	Tensile strength.

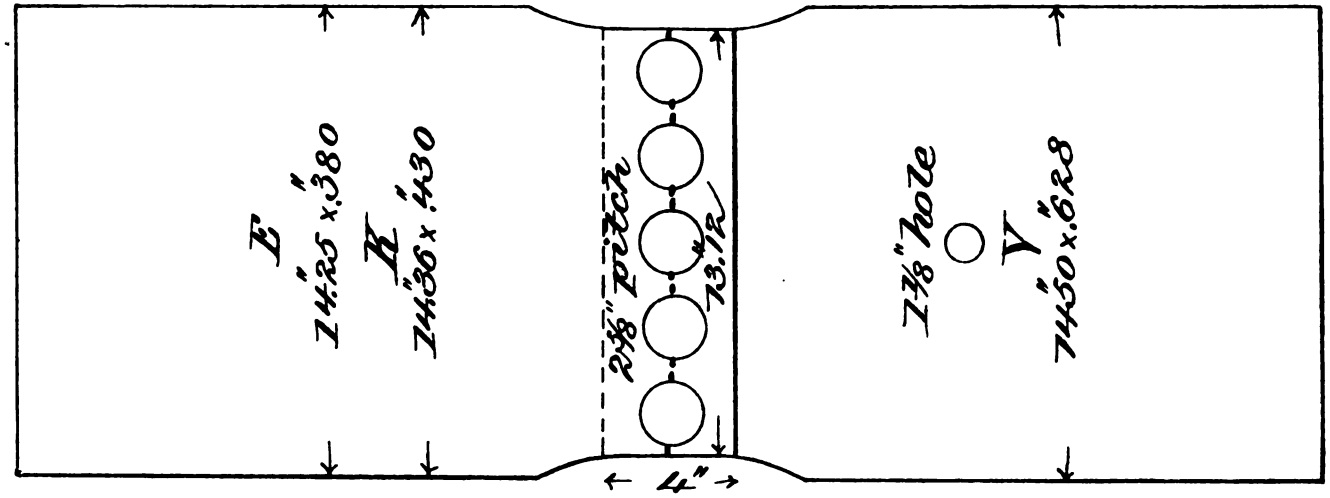
ctured plate along line of riveting.
earance, silky, slightly lamellar. Open at edges ″.12 and ″.20.
gation of rivet-holes, ″.63, ″.57, ″.57, ″.57, ″.57, ″.62.
a at fracture (one section), 1″.17×″.38=.4446 square inch.
traction, 47.5 per cent.

Maximum stress on joint.

on gross section of plate	pounds per square inch..	34,770
on net section of plate	do....	63,220
ion on bearing surface of rivets	do....	77,270
on rivets	do....	26,930

icy of joint, 62.1 per cent.

No. 7472 5/8" steel plate



H Ex 31 49 2

Areas.

gross sectional area	square inches..	8.239
net sectional area	do....	4.706
bearing surface of rivets	do....	3.533
, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
otal.	Per square inch.	Elongation.	Set.	
unds.	*Pounds.*	*Inch.*	*Inch.*	
,239	1,000	0.	0.	Initial load.
,478	2,000	.0001	.....	
,717	3,000	.0004	.....	
,956	4,000	.0008	.....	
,195	5,000	.0010	.0004	
,434	6,000	.0023	.....	
,073	7,000	.0047	.....	
,912	8,000	.0055	.....	
,151	9,000	.0065	.....	
,390	10,000	.0079	.0058	
,629	11,000	.0096	.....	
,868	12,000	.0113	.....	
,107	13,000	.0129	.....	
,346	14,000	.0149	.....	
,585	15,000	.0166	.0128	
,824	16,000	.0183	.....	
,063	17,000	.0197	.....	
,392	18,000	.0218	.....	
,541	19,000	.0244	.....	
,780	20,000	.0268	.0204	
	1,000	.0204	.....	
	2,000	.0204	.....	
	3,000	.0205	.....	
	4,000	.0210	.....	
	5,000	.0212	.....	
	6,000	.0216	.....	
	7,000	.0220	.....	
	8,000	.0222	.....	
	9,000	.0224	.....	
	10,000	.0230	.....	
	11,000	.0234	.....	
	12,000	.0238	.....	
	13,000	.0243	.....	
	14,000	.0246	.....	
	15,000	.0250	.....	
	16,000	.0256	.....	
	17,000	.0260	.....	
	18,000	.0262	.....	
	19,000	.0267	.....	
	20,000	.0273	.....	
,019	21,000	.0285	.....	
,258	22,000	.0330	.....	
,497	23,000	.0412	.....	
,736	24,000	.0532	.....	
,975	25,000	.0655	.0557	
,214	26,000	.0831	.....	
,453	27,000	.0980	.....	
,692	28,000	.1175	.....	
,931	29,000	.13	.....	
,170	30,000	.16	.....	
,409	31,000	.18	.....	
,648	32,000	.21	.....	
,887	33,000	.27	.....	
,126	34,000	.30	.....	
,365	35,000	.36	.....	
,604	36,000	.47	.....	
,500	36,350	.58	.....	Tensile strength.

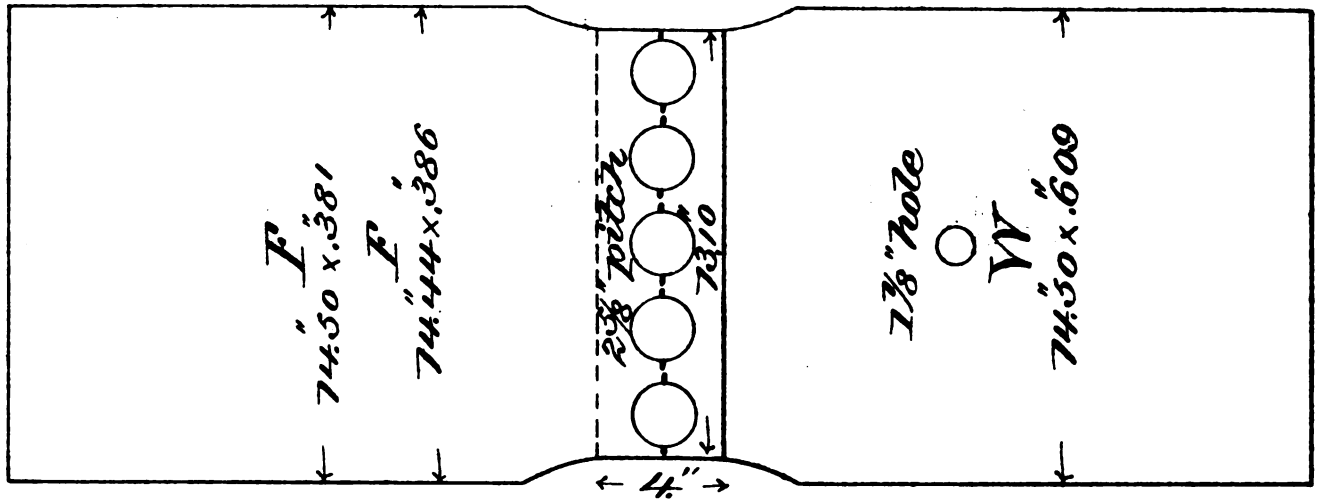
actured plate along line of riveting.
ɔpearance, silky, lamellar. Open at edges ″.05 and ″.15.
ongation of rivet-holes, ″.69, ″.64, ″.61, ″.61, ″.67.
ea at fracture (one section), 1″.28×″.39=.4992 square inch.
ntraction, 47.1 per cent.

Maximum stress on joint.

n on gross section of plate	pounds per square inch.	36,350
n on net section of plate	do....	63,640
ession on bearing surface of rivets	do....	84,7
ng on rivets	do....	30,1

ency of joint, 66.1 per cent.

No. 7473 5/8" steel plate



H Ex 31 49 2

Areas.

ss sectional area	square inches..	7.978
sectional area	do....	4.552
ring surface of rivets	do....	3.426
earing area	do....	9.940

[Joint warped; micrometer on the convex side.]

lied loads.		In gauged length.		Remarks.
	Per square inch.	Elongation.	Set.	
	Pounds.	*Inch.*	*Inch.*	
	1,000	0.	0.	Initial load.
	2,000	−.0002	.....	
	3,000	−.0004	.....	
	4,000	+.0001	.....	
	5,000	.0029	.0035	
	6,000	.0037	.....	
	7,000	.0043	.....	
	8,000	.0051	.....	
	9,000	.0069	.....	
	10,000	.0097	.0112	
	11,000	.0116	.....	
	12,000	.0127	.....	
	13,000	.0136	.....	
	14,000	.0142	.....	
	15,000	.0162	.0165	
	16,000	.0196	.....	
	17,000	.0206	.....	
	18,000	.0220	.....	
	19,000	.0242	.....	
	20,000	.0261	.0247	
	21,000	.0297	.....	
	22,000	.0332	.....	
	23,000	.0398	.....	
	24,000	.0498	.....	
	25,000	.0605	.0557	
	26,000	.0720	.....	
	27,000	.0872	.....	
	28,000	.1040	.....	
	29,000	.1230	.....	
	30,000	.1440	.1345	
	31,000	.19	.....	
	32,000	.22	.....	
	33,000	.26	.....	
	34,000	.30	.....	
	35,000	.36	.....	
	36,000	.42	.....	
	37,000	.53	.....	
	37,100	.60	.....	Tensile strength.

:ured plate along line of riveting.
:arance, silky. Open at edges ″.15 and ″.12.
gation of rivet-holes, ″.72, ″.66, ″.62, ″.63, ″.63.
at fracture (one section), 1″.30×″.40=.5200 square inch.
raction, 43.0 per cent.

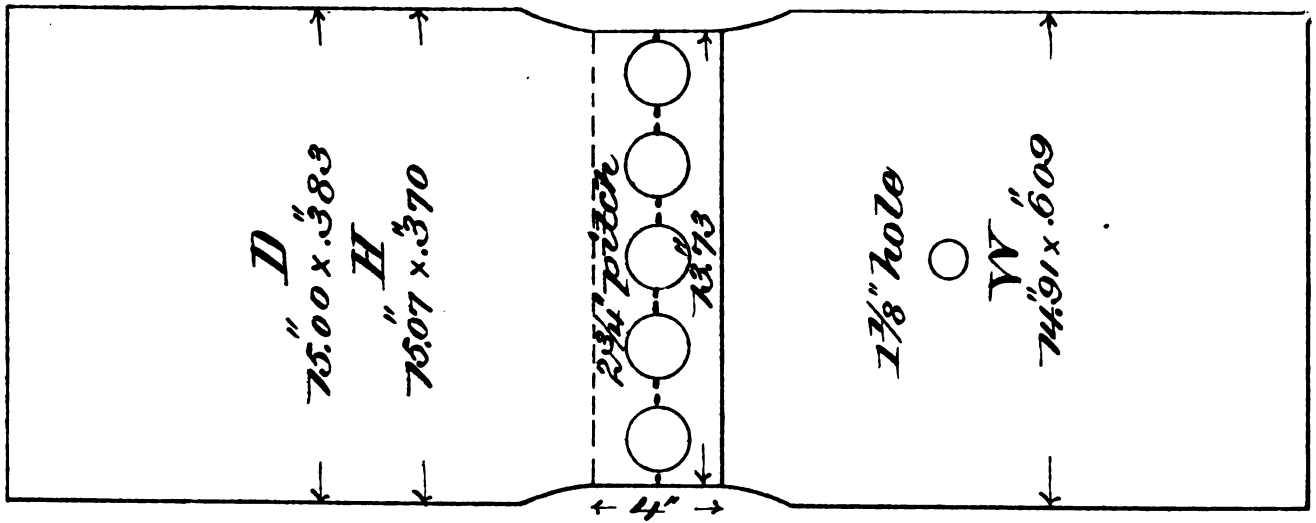
Maximum stress on joint.

ı gross section of plate	pounds per square inch..	37,100
ı net section of plate	do....	65,020
on on bearing surface of rivets	do....	86,400
ɔn rivets	do....	29,780

:y of joint, 64.7 per cent.

No. 7474

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	8.362
Plate, net sectional area	do	4.936
Plate, bearing surface of rivets	do	3.426
Rivets, shearing area	do	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,362	1,000	0.	0.	Initial load.
16,724	2,000	.0000	.....	
25,086	3,000	.0002	.....	
33,448	4,000	.0003	.....	
41,810	5,000	.0030	.0032	
50,172	6,000	.0043	.....	
58,534	7,000	.0051	.....	
66,896	8,000	.0066	.....	
75,258	9,000	.0079	.....	
83,620	10,000	.0092	.0084	
91,982	11,000	.0109	.....	
100,344	12,000	.0125	.....	
108,706	13,000	.0137	.....	
117,068	14,000	.0146	.....	
125,430	15,000	.0159	.0129	
133,792	16,000	.0172	.....	
142,154	17,000	.0187	.....	
150,516	18,000	.0207	.....	
158,878	19,000	.0238	.....	
167,240	20,000	.0294	.0240	
175,602	21,000	.0342	.....	
183,964	22,000	.0392	.....	
192,326	23,000	.0432	.....	
200,688	24,000	.0507	.....	
209,050	25,000	.0595	.0524	
217,412	26,000	.0725	.....	
225,774	27,000	.0846	.....	
234,136	28,000	.1022	.....	
242,498	29,000	.1235	.....	
250,860	30,000	.14	.....	
259,222	31,000	.17	.....	
267,584	32,000	.20	.....	
275,946	33,000	.24	.....	
284,308	34,000	.28	.....	
292,670	35,000	.32	.....	
301,032	36,000	.38	.....	
309,394	37,000	.46	.....	
317,756	38,000	.57	.....	
319,000	38,150	.62	.....	Tensile strength.

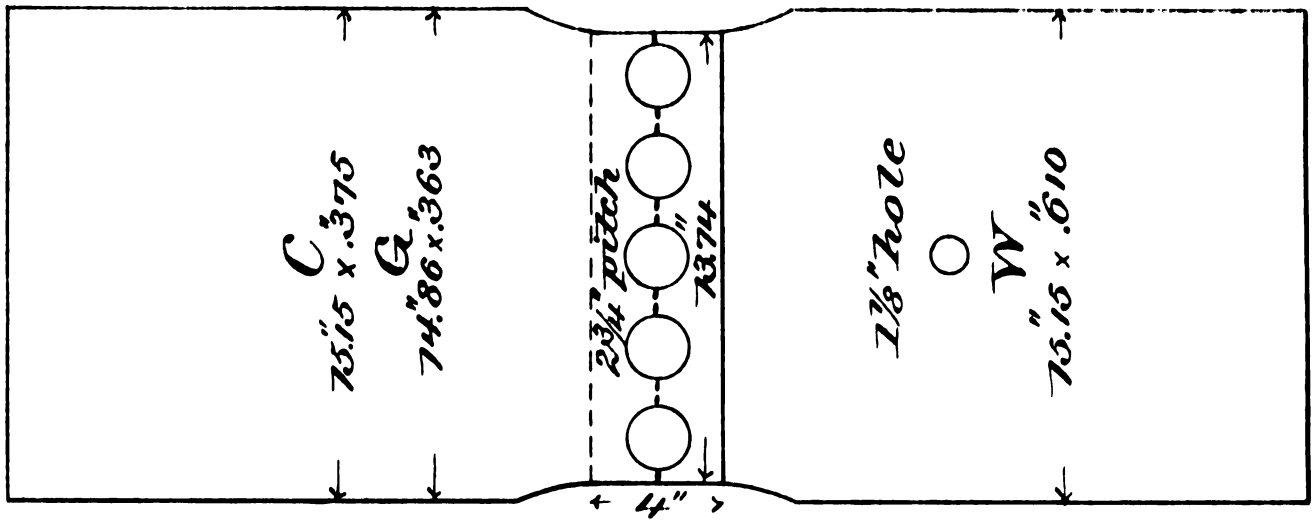
Fractured plate along line of riveting.
Appearance, silky.
Area at fracture (one section), 1″.39×″.40=.5560 square inch.
Contraction, 43.8 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,150
Tension on net section of plate	do	64,630
Compression on bearing surface of rivets	do	93,110
Shearing on rivets	do	32,090

Efficiency of joint, 66.5 per cent.

No. 1115 5/8" steel plate



H Ex 31 49 2

Areas.

gross sectional area	square inches	8.381
net sectional area	do	4.950
bearing surface of rivets	do	3.431
, shearing area	do	9.940

Applied loads.		In ganged length.		Remarks.
otal.	Per square inch.	Elongation.	Set.	
unds.	*Pounds.*	*Inch.*	*Inch.*	
,381	1,000	0.	0.	Initial load.
,761	2,000	—.0002	.....	
,143	3,000	.0000	.....	
,524	4,000	.0004	.....	
,905	5,000	.0022	.0014	
,286	6,000	.0048	.....	
,667	7,000	.0063	.....	
,048	8,000	.0071	.....	
,429	9,000	.0083	.....	
,810	10,000	.0097	.0073	
,191	11,000	.0112	.....	
,572	12,000	.0126	.....	
,953	13,000	.0144	.....	
,334	14,000	.0157	.....	
,715	15,000	.0169	.0122	
,096	16,000	.0190	.....	
,474	17,000	.0205	.....	
,858	18,000	.0214	.....	
,239	19,000	.0225	.....	
,620	20,000	.0240	.0178	
,001	21,000	.0268	.....	
,382	22,000	.0285	.....	
,763	23,000	.0307	.....	
,144	24,000	.0350	.....	
,525	25,000	.0510	.0400	
,906	26,000	.0715	.....	
,287	27,000	.0860	.....	
,668	28,000	.1035	.....	
,049	29,000	.1230	.....	
,430	30,000	.14	.....	
,811	31,000	.17	.....	
,192	32,000	.19	.....	
,573	33,000	.22	.....	
,954	34,000	.27	.....	
,335	35,000	.31	.....	
,716	36,000	.37	.....	
,097	37,000	.43	.....	
,478	38,000	.52	.....	
,500	38,120	.56	.....	Tensile strength.

ractured plate along line of riveting.
ppearance, silky, lamellar. Open at edges ″.10 and ″.35.
longation of rivet-holes, ″.72, ″.70, ″.70, ″.74, ″.82.
rea at fracture (one section), 1″.38×″.37=.5106 square inch.
ontraction, 48.4 per cent.

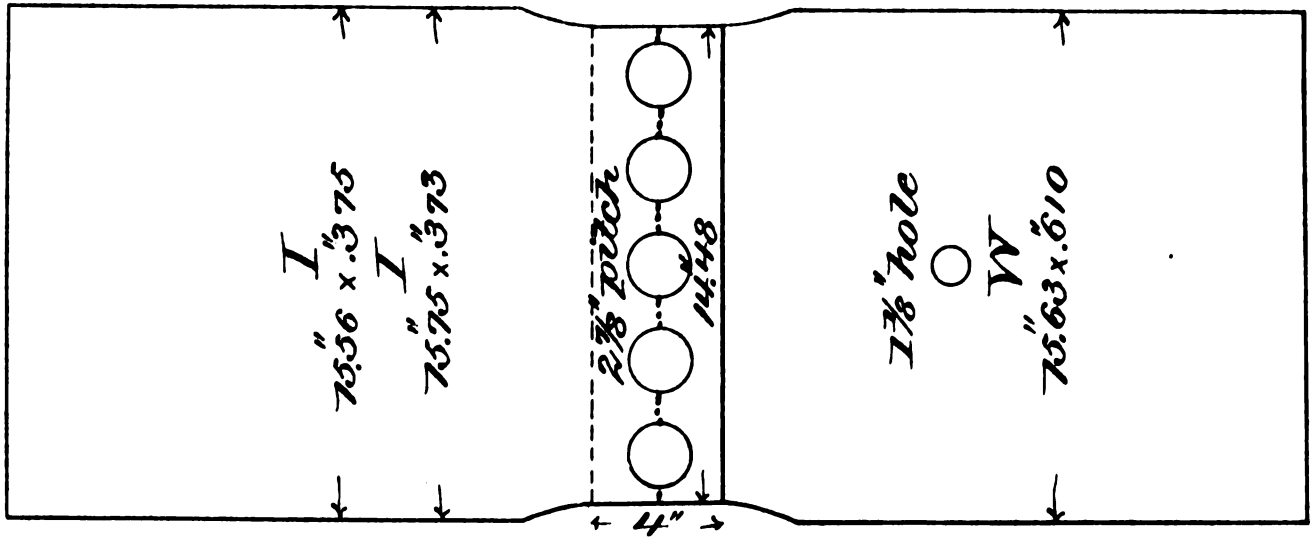
Maximum stress on joint.

on on gross section of plate	pounds per square inch	38,120
on on net section of plate	do	64,540
ression on bearing surface of rivets	do	93,120
ng on rivets	do	32,140

iency of joint, 66.5 per cent.

No. 7476

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	8.833
Plate, net sectional area	do	5.402
Plate, bearing surface of rivets	do	3.431
Rivets, shearing area	do	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,833	1,000	0.	0.	Initial load.
17,666	2,000	.0003	.....	
26,499	3,000	.0005	.....	
35,332	4,000	.0010	.....	
44,165	5,000	.0025	.0019	
52,998	6,000	.0042	.....	
61,831	7,000	.0064	.....	
70,664	8,000	.0079	.....	
79,497	9,000	.0092	.....	
88,330	10,000	.0107	.0084	
97,163	11,000	.0123	.....	
105,996	12,000	.0135	.....	
114,829	13,000	.0151	.....	
123,662	14,000	.0166	.....	
132,495	15,000	.0184	.0144	
141,328	16,000	.0206	.....	
150,161	17,000	.0222	.....	
158,994	18,000	.0239	.....	
167,827	19,000	.0255	.....	
176,660	20,000	.0282	.0205	
185,493	21,000	.0314	.....	
194,326	22,000	.0357	.....	
203,159	23,000	.0449	.....	
211,992	24,000	.0559	.....	
220,825	25,000	.0714	.0606	
229,658	26,000	.0898	.....	
238,491	27,000	.1054	.....	
247,324	28,000	.1219	.....	
256,157	29,000	.14	.....	
264,990	30,000	.17	.....	
273,823	31,000	.19	.....	
282,656	32,000	.23	.....	
291,489	33,000	.27	.....	
300,322	34,000	.31	.....	
309,155	35,000	.37	.....	
317,988	36,000	.42	.....	
326,821	37,000	.50	.....	
335,654	38,000	.61	.....	
341,100	38,620	.75	.....	Tensile strength.

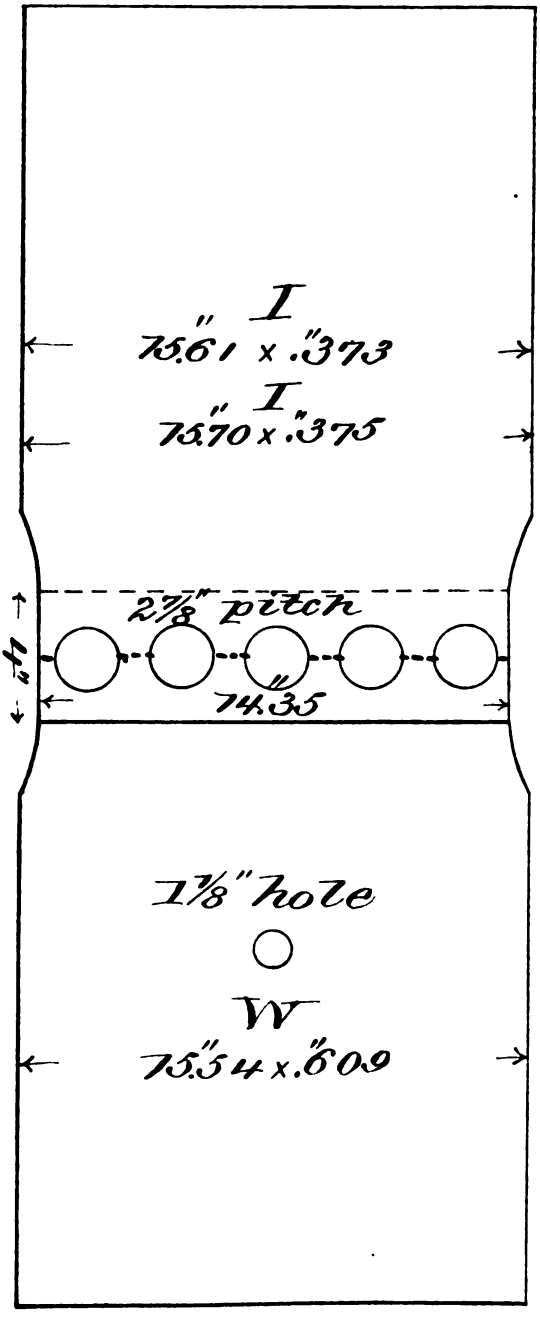
Fractured plate along line of riveting.
Appearance, silky. Open at middle ″.20.
Elongation of rivet-holes, ″.86, ″.91, ″.96, 1″.01, 1″.01.
Area at fracture (one section), 1.″48 × ″.38 = .5624 square inch.
Contraction, 47.3 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,620
Tension on net section of plate	do	63,140
Compression on bearing surface of rivets	do	99,410
Shearing on rivets	do	34,310

Efficiency of joint, 67.4 per cent.

H Ex 31 492



Areas.

Plate, gross sectional area	square inches..	8.739
Plate, net sectional area	do....	5.313
Plate, bearing surface of rivets	do....	3.426
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,739	1,000	0.	0.	Initial load.
17,478	2,000	.0002	.....	
26,217	3,000	.0005	.....	
34,956	4,000	.0008	.....	
43,695	5,000	.0015	.0010	
52,434	6,000	.0034	.....	
61,173	7,000	.0059	.....	
69,912	8,000	.0077	.....	
78,651	9,000	.0098	.....	
87,390	10,000	.0114	.0095	
96,129	11,000	.0130	.....	
104,868	12,000	.0142	.....	
113,607	13,000	.0158	.....	
122,346	14,000	.0174	.....	
131,085	15,000	.0188	.0155	
139,824	16,000	.0206	.....	
148,563	17,000	.0219	.....	
157,302	18,000	.0230	.....	
166,041	19,000	.0250	.....	
174,780	20,000	.0272	.0213	
183,519	21,000	.0327	.....	
192,258	22,000	.0411	.....	
200,997	23,000	.0526	.....	
209,736	24,000	.0671	.....	
218,475	25,000	.0826	.0730	
227,214	26,000	.1060	.....	
235,953	27,000	.1170	.....	
244,692	28,000	.135	.....	
253,431	29,000	.17	.....	
262,170	30,000	.19	.....	
270,909	31,000	.21	.....	
279,648	32,000	.24	.....	
288,387	33,000	.29	.....	
297,126	34,000	.33	.....	
305,865	35,000	.39	.....	
314,604	36,000	.46	.....	
323,343	37,000	.53	.....	
332,082	38,000	.67	.....	
333,800	38,180	.73	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky Open at middle ″.12.
Elongation of rivet-holes, ″.78, ″.78, ″.78, ″.84, ″.86.
Area at fracture (one section), 1″.50 × ″.38 = .5700 square inch.
Contraction, 46.5 per cent.

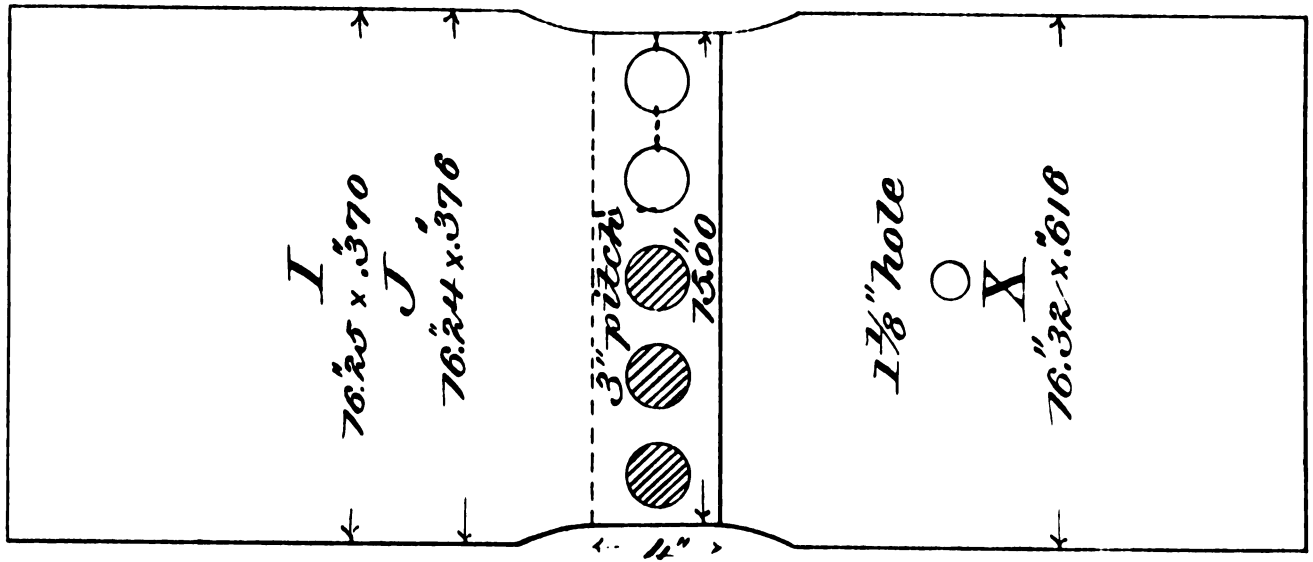
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,180
Tension on net section of plate	do....	62,830
Compression on bearing surface of rivets	do....	97,430
Shearing on rivets	do....	33,580

Efficiency of joint, 66.6 per cent.

No. 1478

5/8" steel plate



H Ex 31 ... 49 2

Areas.

Plate, gross sectional area	square inches	9.240
Plate, net sectional area	do	5.775
Plate, bearing surface of rivets	do	3.465
Rivets, shearing area	do	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,240	1,000	0.	0.	Initial load.
18,480	2,000	.0003	.....	
27,720	3,000	.0007	.....	
36,960	4,000	.0016	.....	
46,200	5,000	.0072	.0062	
55,440	6,000	.0085	.....	
64,680	7,000	.0106	.....	
73,920	8,000	.0127	.....	
83,160	9,000	.0140	.....	
92,400	10,000	.0156	.0132	
101,640	11,000	.0180	.....	
110,880	12,000	.0194	.....	
120,120	13,000	.0207	.....	
129,360	14,000	.0223	.....	
138,600	15,000	.0240	.0187	
147,840	16,000	.0260	.....	
157,080	17,000	.0281	.....	
166,320	18,000	.0293	.....	
175,560	19,000	.0206	.....	
184,800	20,000	.0327	.0254	
194,040	21,000	.0371	.....	
203,280	22,000	.0401	.....	
212,520	23,000	.0452	.....	
221,760	24,000	.0586	.....	
231,000	25,000	.0860	.0758	
240,240	26,000	.1091	.....	
249,480	27,000	.1294	.....	
258,720	28,000	.16	.....	
267,960	29,000	.20	.....	
277,200	30,000	.22	.....	
286,440	31,000	.27	.....	
295,680	32,000	.30	.....	
304,920	33,000	.34	.....	
314,160	34,000	.41	.....	
323,400	35,000	.48	.....	
332,640	36,000	.58	.....	
341,880	37,000	.67	.....	
351,120	38,000	.78	.....	
355,600	38,480	.86	.....	Tensile strength.

Sheared three rivets and fractured the plate across two sections, and then tore out to edge of lap.

Area at fracture (one section), 1″.61 × ″.39 = .6279 square inch.

Contraction, 45.6 per cent.

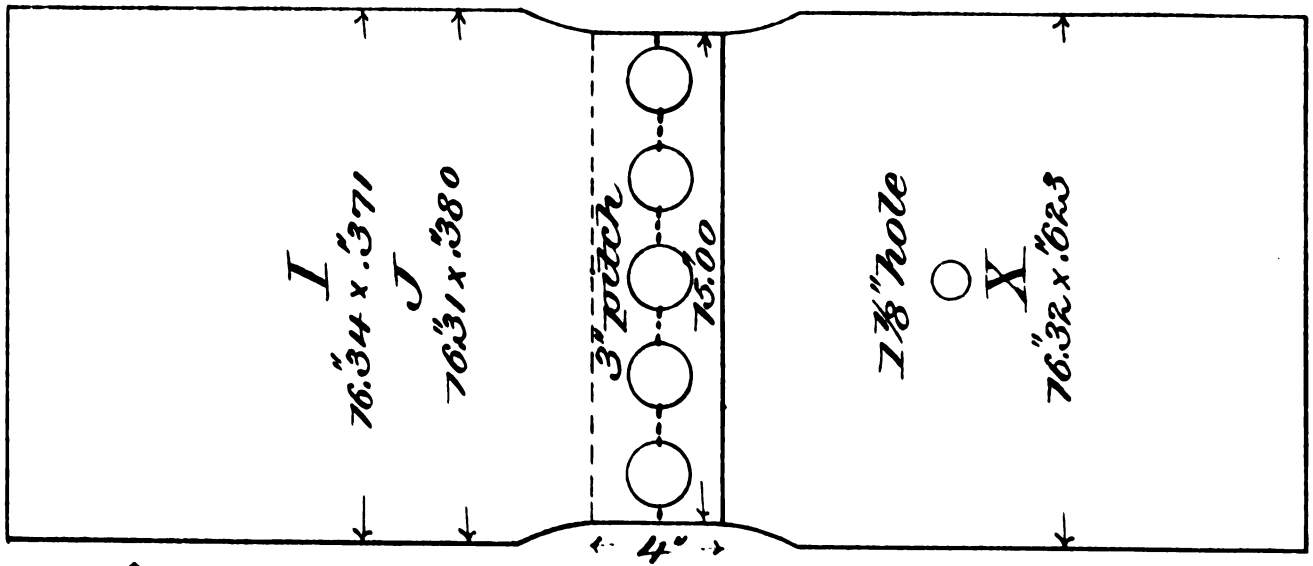
Elongation of rivet-holes (end ″.55, ″.64, middle ″.70; sheared rivets in these holes), ″.95, ″.90.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,480
Tension on net section of plate	do	61,570
Compression on bearing surface of rivets	do	102,630
Shearing on rivets	do	35,770

Efficiency of joint, 68.7 per cent.

No. 1419 5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.345
Plate, net sectional area	do	5.841
Plate, bearing surface of rivets	do	3.504
Rivets, shearing area	do	9.940

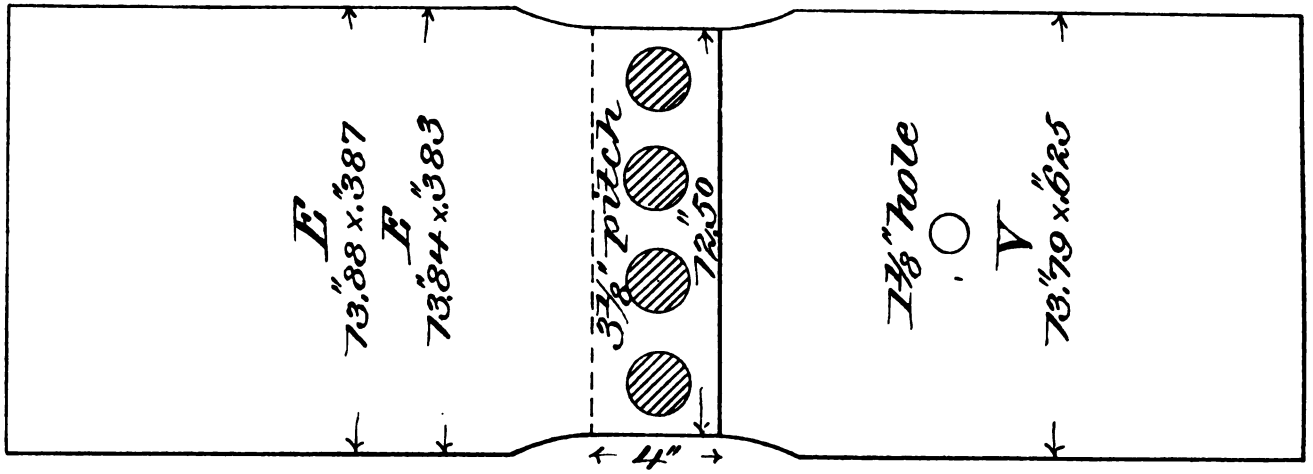
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,345	1,000	0.	0.	Initial load.
18,690	2,000	.0002	.....	
28,035	3,000	.0004	.....	
37,380	4,000	.0008	.....	
46,725	5,000	.0013	.0008	
56,070	6,000	.0023	.....	
65,415	7,000	.0039	.....	
74,760	8,000	.0055	.....	
84,105	9,000	.0075	.....	
93,450	10,000	.0093	.0076	
102,795	11,000	.0113	.....	
112,140	12,000	.0126	.....	
121,485	13,000	.0133	.....	
130,830	14,000	.0143	.....	
140,175	15,000	.0156	.0116	
149,520	16,000	.0176	.....	
158,865	17,000	.0194	.....	
168,210	18,000	.0211	.....	
177,555	19,000	.0227	.....	
186,900	20,000	.0254	.0189	
196,245	21,000	.0290	.....	
205,590	22,000	.0370	.....	
214,935	23,000	.0545	.....	
224,280	24,000	.0720	.....	
233,625	25,000	.0892	.0790	
242,970	26,000	.1103	.....	
252,315	27,000	.1253	.....	
261,660	28,000	.16	.....	
271,005	29,000	.18	.....	
280,350	30,000	.20	.....	
289,695	31,000	.23	.....	
299,040	32,000	.28	.....	
308,385	33,000	.33	.....	
317,730	34,000	.39	.....	
327,075	35,000	.46	.....	
336,420	36,000	.55	.....	
345,765	37,000	.65	.....	
355,110	38,000	.78	.....	
358,950	38,410	.92	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.20 and ″.13.
Elongation of rivet-holes, ″.94, ″.90, ″.89, ″.95, 1″.02.
Area at fracture (one section), 1″.65×″.40=.6600 square inch.
Contraction, 43.4 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,410
Tension on net section of plate	do	61,430
Compression on bearing surface of rivets	do	102,440
Shearing on rivets	do	36,110

Efficiency of joint, 68.6 per cent.



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.813
Plate, net sectional area	do	5.000
Plate, bearing surface of rivets	do	2.813
Rivets, shearing area	do	7.952

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,813	1,000	0.	0.	Initial load.
15,626	2,000	.0000	.....	
23,439	3,000	.0001	.....	
31,252	4,000	.0004	.....	
39,065	5,000	.0057	.0054	
46,878	6,000	.0069	.....	
54,691	7,000	.0079	.....	
62,504	8,000	.0087	.....	
70,317	9,000	.0099	.....	
78,130	10,000	.0109	.0099	
85,943	11,000	.0128	.....	
93,756	12,000	.0142	.....	
101,569	13,000	.0157	.....	
109,382	14,000	.0172	.....	
117,195	15,000	.0187	.0156	
125,008	16,000	.0205	.....	
132,821	17,000	.0217	.....	
140,634	18,000	.0230	.....	
148,447	19,000	.0247	.....	
156,260	20,000	.0270	.0210	
164,073	21,000	.0315	.....	
171,886	22,000	.0365	.....	
179,699	23,000	.0460	.....	
187,512	24,000	.0653	.....	
195,325	25,000	.0930	.0834	
203,138	26,000	.12	.....	
210,951	27,000	.15	.....	
218,764	28,000	.17	.....	
226,577	29,000	.20	.....	
234,390	30,000	.22	.....	
242,203	31,000	.27	.....	
250,016	32,000	.30	.....	
257,829	33,000	.36	.....	
265,642	34,000	.44	.....	
273,455	35,000	.52	.....	
281,268	36,000	.60	.....	
289,081	37,000	.70	.....	
291,800	37,340	.77	.....	Tensile strength.

Sheared the rivets.

Rivet at edge A sheared first, followed by the others in succession.

Elongation of rivet-holes, $\overset{A}{''.49}$, $''.51$, $''.56$, $\overset{B}{''.63}$.

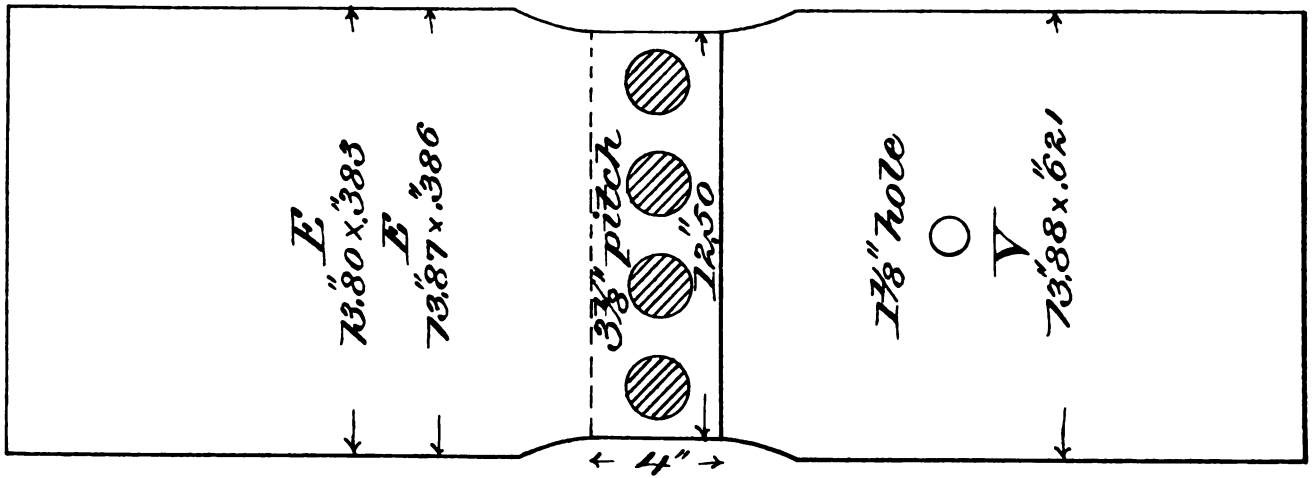
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	37,340
Tension on net section of plate	do	58,360
Compression on bearing surface of rivets	do	103,730
Shearing on rivets	do	36,690

Efficiency of joint, 67.9 per cent.

No. 7481

5/8" steel plate



H Ex 31 49 2

Areas.

oss sectional area	square inches..	7.763
t sectional area	do....	4.968
aring surface of rivets	do....	2.795
hearing area	do....	7.952

pplied loads.		In gauged length.		Remarks.
l.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
33	1,000	0.	0.	Initial load.
26	2,000	.0002	.....	
39	3,000	.0004	.....	
52	4,000	.0007	.....	
15	5,000	.0039	.0036	
78	6,000	.0058	.....	
41	7,000	.0071	.....	
04	8,000	.0089	.....	
67	9,000	.0100	.....	
30	10,000	.0112	.0095	
93	11,000	.0134	.....	
56	12,000	.0148	.....	
19	13,000	.0162	.....	
82	14,000	.0176	.....	
45	15,000	.0193	.0156	
08	16,000	.0211	.....	
71	17,000	.0226	.....	
34	18,000	.0239	.....	
97	19,000	.0262	.....	
50	20,000	.0290	.0234	
23	21,000	.0359	.....	
86	22,000	.0447	.....	
49	23,000	.0611	.....	
12	24,000	.0800	.....	
75	25,000	.0980	.0884	
38	26,000	.1225	.....	
01	27,000	.13	.....	
64	28,000	.17	.....	
27	29,000	.19	.....	
90	30,000	.22	.....	
53	31,000	.26	.....	
16	32,000	.30	.....	
79	33,000	.37	.....	
42	34,000	.43	.....	
05	35,000	.50	.....	
68	36,000	.60	.....	
31	37,000	.71	.....	
94	38,000	.86	.....	
00	38,440	1.00	.....	Tensile strength.

ared the rivets.
ngation of rivet-holes, ″.64, ″.68, ″.73, ″.83.

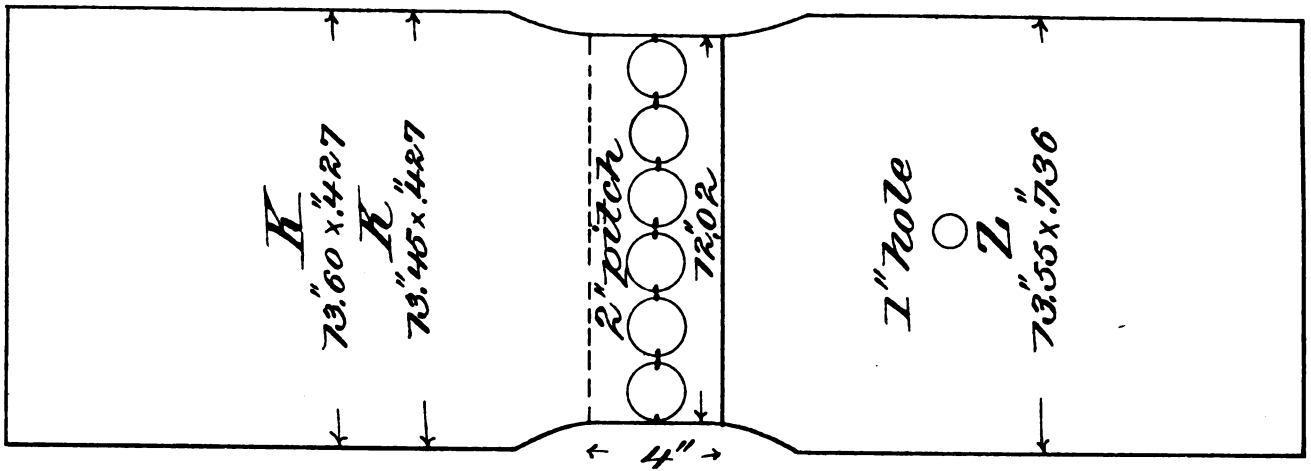
Maximum stress on joint.

on gross section of plate	pounds per square inch..	38,440
on net section of plate	do....	60,060
sion on bearing surface of rivets	do....	106,760
on rivets	do....	37,520

ncy of joint, 69.9 per cent.

No. 1482

3/4 steel plate



H Ex 31 49 2

Areas.

sectional area	square inches..	8.847
ectional area	do....	4.431
ng surface of rivets	do....	4.416
ring area	do....	9.425

ied loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0013	.....	
3,000	.0005	.....	
4,000	.0039	.....	
5,000	.0063	.0059	
6,000	.0079	.....	
7,000	.0093	.....	
8,000	.0105	.....	
9,000	.0127	.....	
10,000	.0144	.0124	
11,000	.0163	.....	
12,000	.0183	.....	
13,000	.0204	.....	
14,000	.0200	.....	
15,000	.0215	.0175	
16,000	.0238	.....	
17,000	.0248	.....	
18,000	.0270	.....	
19,000	.0300	.....	
20,000	.0360	.0287	
21,000	.0447	.....	
22,000	.0520	.....	
23,000	.0615	.....	
24,000	.0715	.....	
25,000	.0840	.0742	
26,000	.1005	.....	
27,000	.12	.....	
28,000	.16	.....	
29,000	.18	.....	
30,000	.20	.....	
31,000	.27	.....	
31,990	.36	.....	Tensile strength.

ired plate along line of riveting.
arance, silky, slightly lamellar. Open at edges ″.03 and ″.08.
ation of rivet-holes, ″.53 each.
at fracture (one section), ″.78×″.44=.3432 square inch.
action, 53.4 per cent.

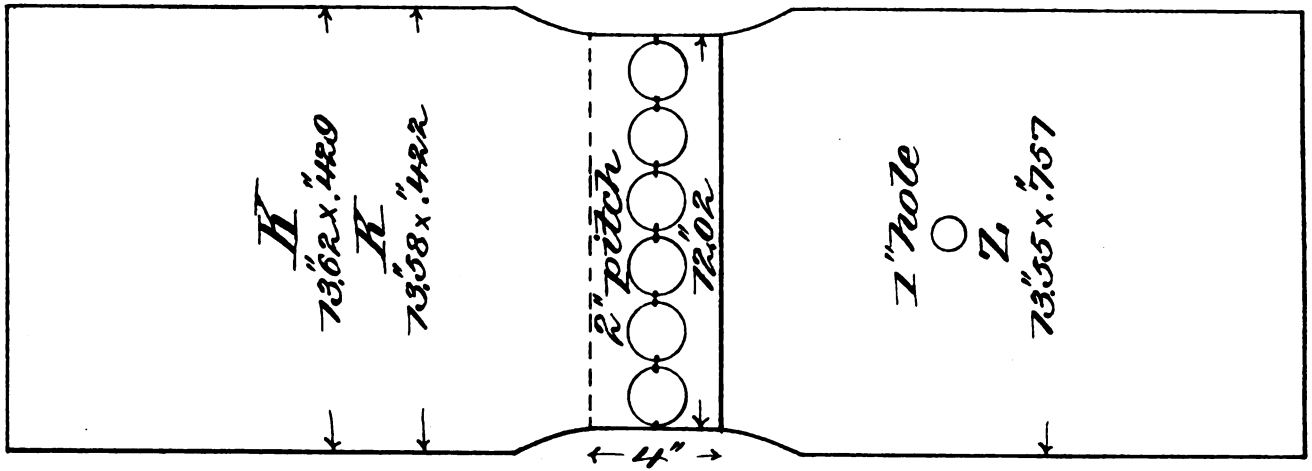
Maximum stress on joint.

gross section of plate	pounds per square inch..	31,900
net section of plate	do....	63,870
n on bearing surface of rivets	do....	64,090
rivets	do....	30,030

of joint, 54.2 per cent.

No. 7483

3/4" steel plate



H Ex 31 49 2

Areas.

›ss sectional area	square inches..	9.099
t sectional area	do....	4.557
aring surface of rivets	do....	4.542
hearing area	do....	9.425

›plied loads.		In gauged length.		Remarks.
1.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
9	1,000	0.	0.	Initial load.
8	2,000	.0000	.....	
7	3,000	.0001	.....	
6	4,000	.0002	.....	
5	5,000	.0006	.0003	
4	6,000	.0038	.....	
3	7,000	.0056	.....	
2	8,000	.0065	.....	
1	9,000	.0074	.....	
0	10,000	.0082	.0072	
9	11,000	.0096	.....	
8	12,000	.0107	.....	
7	13,000	.0121	.....	
6	14,000	.0139	.....	
5	15,000	.0155	.0140	
4	16,000	.0171	.....	
3	17,000	.0181	.....	
2	18,000	.0193	.....	
1	19,000	.0205	.....	
0	20,000	.0223	.0175	
9	21,000	.0258	.....	
8	22,000	.0345	.....	
7	23,000	.0422	.....	
6	24,000	.0552	.....	
5	25,000	.0724	.0638	
4	26,000	.0895	.....	
3	27,000	.1053	.....	
2	28,000	.1260	.....	
1	29,000	.15	.....	
0	30,000	.18	.....	
9	31,000	.23	.....	
0	31,980	.35	.....	Tensile strength.

ctured plate along line of riveting.
›earance, silky. Open at edges ″.05 and ″.20.
›gation of rivet-holes, ″.61, ″.54, ″.54, ″.56, ″.59, ″.62.
a at fracture (one section), ″.75×″.46=.345 square inch.
traction, 54.4 per cent.

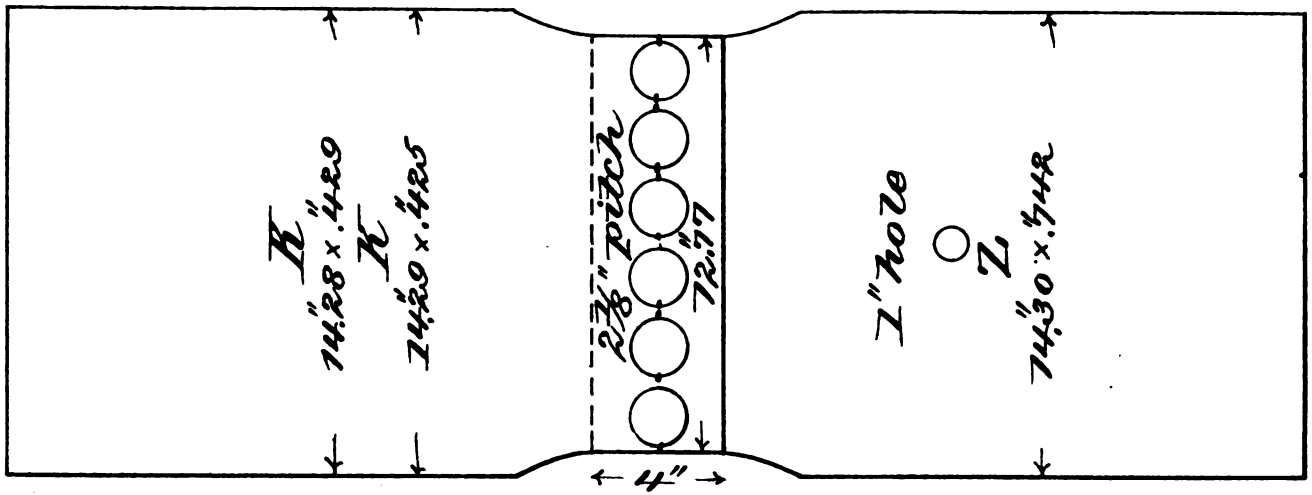
Maximum stress on joint.

on gross section of plate	pounds per square inch..	34,980
on net section of plate	do....	63,860
sion on bearing surface of rivets	do....	64,070
on rivets	do....	30,870

›cy of joint, 54.2 per cent.

No. 7484

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.475
Plate, net sectional area	do	5.023
Plate, bearing surface of rivets	do	4.452
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,475	1,000	0.	0.	Initial load.
18,950	2,000	.0001	.....	
28,425	3,000	.0003	.....	
37,900	4,000	.0015	.....	
47,375	5,000	.0039	.0029	
56,850	6,000	.0048	.....	
66,325	7,000	.0072	.....	
75,800	8,000	.0089	.....	
85,275	9,000	.0101	.....	
94,750	10,000	.0114	.0089	
104,225	11,000	.0133	.....	
113,700	12,000	.0142	.....	
123,175	13,000	.0153	.....	
132,650	14,000	.0163	.....	
142,125	15,000	.0177	.0129	
151,600	16,000	.0189	.....	
161,075	17,000	.0199	.....	
170,550	18,000	.0211	.....	
180,025	19,000	.0233	.....	
189,500	20,000	.0275	.0204	
198,975	21,000	.0349	.....	
208,450	22,000	.0426	.....	
217,925	23,000	.0504	.....	
227,400	24,000	.0614	.....	
236,875	25,000	.0748	.0644	
246,350	26,000	.0895	.....	
255,825	27,000	.1030	.....	
265,300	28,000	.12	.....	
274,775	29,000	.15	.....	
284,250	30,000	.18	.....	
293,725	31,000	.21	.....	
303,200	32,000	.26	.....	
312,675	33,000	.30	.....	
322,150	34,000	.37	.....	
326,300	34,440	.48	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.10 each.
Elongation of rivet-holes, ″.56, ″.56, ″.56, ″.54, ″.56, ″.58.
Area at fracture (one section), ″.91×″.45=.4095 square inch.
Contraction, 50.9 per cent.

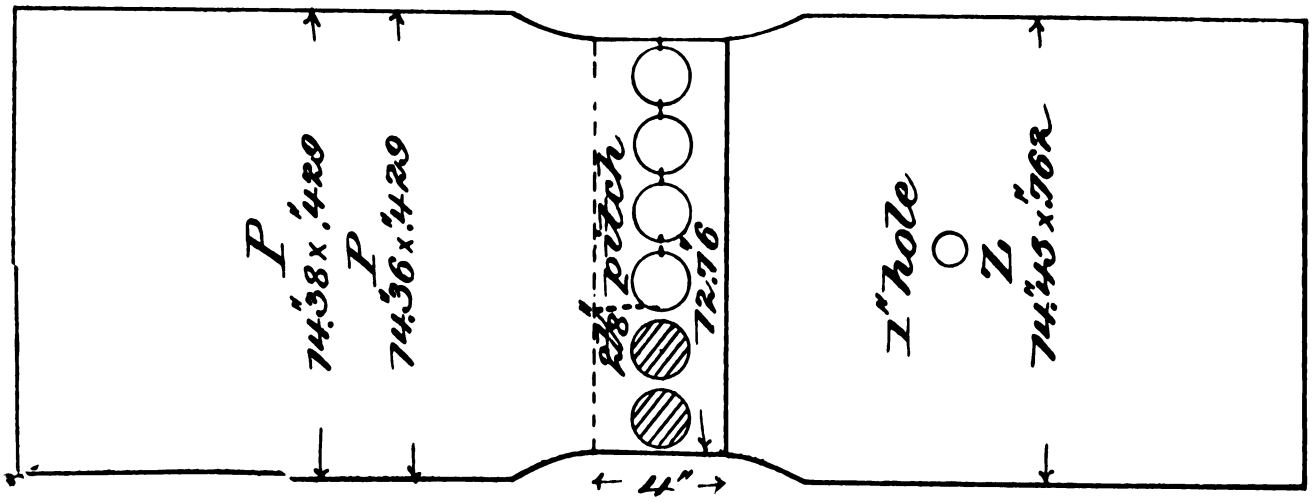
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,440
Tension on net section of plate	do	64,960
Compression on bearing surface of rivets	do	73,290
Shearing on rivets	do	34,620

Efficiency of joint, 58.3 per cent.

No. 7485

3/4" steel plate



H Ex 31 ... 49 2

Areas.

Plate, gross sectional area	square inches	9.723
Plate, net sectional area	do	5.151
Plate, bearing surface of rivets	do	4.572
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,723	1,000	0.	0.	Initial load.
19,446	2,000	.0000	.....	
29,169	3,000	.0002	.....	
38,892	4,000	.0002	.....	
48,615	5,000	.0003	0.	
58,338	6,000	.0004	.....	
68,061	7,000	.0008	.....	
77,784	8,000	.0011	.....	
87,507	9,000	.0021	.....	
97,230	10,000	.0033	.0030	
106,953	11,000	.0048	.....	
116,676	12,000	.0058	.....	
126,399	13,000	.0066	.....	
136,122	14,000	.0076	.....	
145,845	15,000	.0084	.0073	
155,568	16,000	.0098	.....	
165,291	17,000	.0109	.....	
175,014	18,000	.0123	.....	
184,737	19,000	.0144	.....	
194,460	20,000	.0168	.0140	
204,183	21,000	.0202	.....	
213,906	22,000	.0223	.....	
223,629	23,000	.0274	.....	
233,352	24,000	.0425	.....	
243,075	25,000	.0590	.0513	
252,798	26,000	.0739	.....	
262,521	27,000	.0853	.....	
272,244	28,000	.1008	.....	
281,967	29,000	.1209	.....	
291,690	30,000	.15	.....	
301,413	31,000	.17	.....	
311,136	32,000	.21	.....	
320,859	33,000	.26	.....	
330,582	34,000	.34	.....	
337,400	34,700	.44	.....	Tensile strength.

Fractured plate across four sections.

Sheared two rivets.

Appearance, silky, except where the plate tore out to edge of lap, which was granular near the edges.

Elongation of rivet-holes (″.26, ″.36; sheared rivets in these holes), ″.62, ″.69, ″.60, ″.55.

Area at fracture (one section), ″.89×″.46=.4094 square inch.

Contraction, 52.2 per cent.

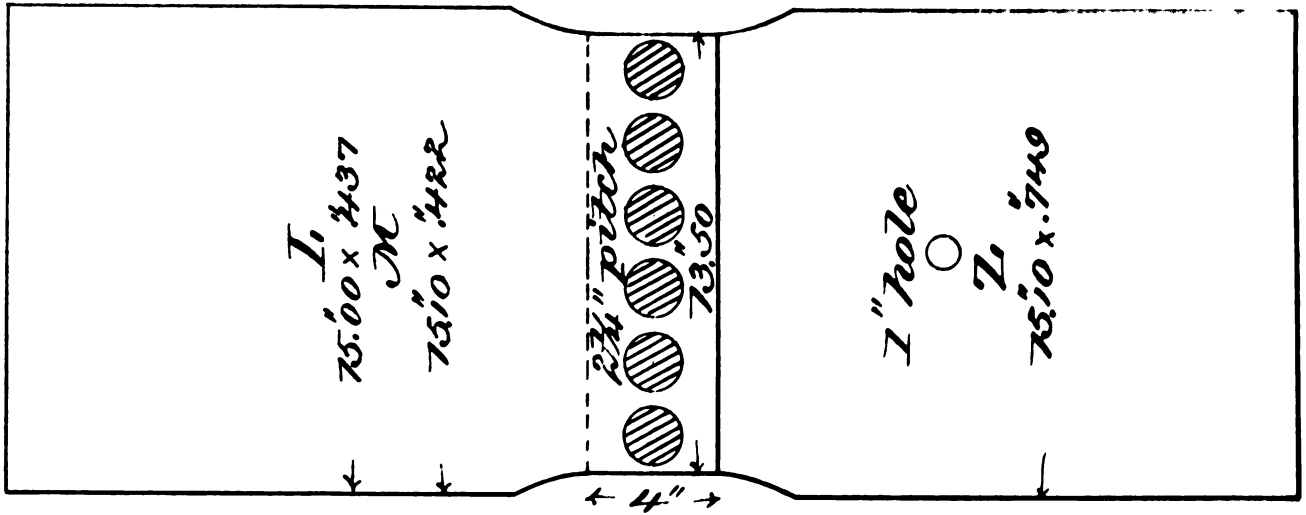
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,700
Tension on net section of plate	do	67,340
Compression on bearing surface of rivets	do	78,790
Shearing on rivets	do	35,800

Efficiency of joint, 58.8 per cent.

No. 7486

3/4" steel plate



H Ex 31 49 2

Areas.

oss sectional area	square inches..	10.112
t sectional area	do....	5.618
aring surface of rivets	do....	4.494
hearing area	do....	9.425

pplied loads.		In ganged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
12	1,000	0.	0.	Initial load.
24	2,000	.0003	.....	
36	3,000	.0006	.....	
48	4,000	.0024	.....	
60	5,000	.0038	.0037	
72	6,000	.0053	.....	
84	7,000	.0071	.....	
96	8,000	.0091	.....	
08	9,000	.0108	.....	
20	10,000	.0116	.0104	
32	11,000	.0133	.....	
44	12,000	.0141	.....	
56	13,000	.0150	.....	
68	14,000	.0158	.....	
80	15,000	.0167	.0138	
92	16,000	.0188	.....	
04	17,000	.0205	.....	
16	18,000	.0218	.....	
28	19,000	.0228	.....	
40	20,000	.0244	.0198	
52	21,000	.0302	.....	
64	22,000	.0363	.....	
76	23,000	.0513	.....	
88	24,000	.0640	.....	
00	25,000	.0783	.0695	
12	26,000	.0908	.....	
24	27,000	.1059	.....	
36	28,000	.1240	.....	
48	29,000	.15	.....	
60	30,000	.17	.....	
72	31,000	.20	.....	
84	32,000	.24	.....	
96	33,000	.27	.....	
08	34,000	.35	.....	
20	35,000	.44	.....	Tensile strength.

ared the rivets.
ngation of rivet-holes, ″.28 each.

Maximum stress on joint.

on gross section of plate	pounds per square inch..	35,000
on net section of plate	do....	63,000
sion on bearing surface of rivets	do....	78,750
on rivets	do....	37,550

ncy of joint, 59.3 per cent.

H Ex 31 49 2

Sk. 5000 F

Areas.

te, gross sectional area	square inches	10.329
te, net sectional area	do	5.745
te, bearing surface of rivets	do	4.584
ets, shearing area	do	9.425

[Steel rivets.]

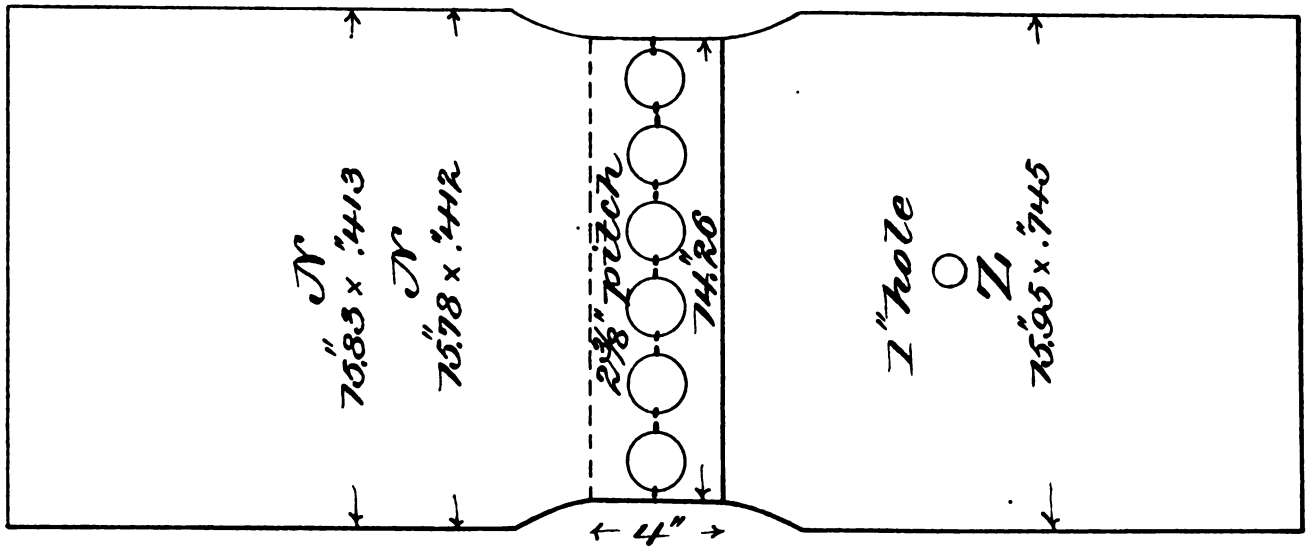
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
379,900	36,780	.37	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky.
Area at fracture (one section), 1″.01×″.47=.4747 square inch.
Contraction, 50.3 per cent.
Elongation of rivet-holes, ″.46, ″.48, ″.53, ″.56, ″.56, ″.45.

Maximum stress on joint.

sion on gross section of plate	pounds per square inch	36,780
sion on net section of plate	do	66,130
pression on bearing surface of rivets	do	82,870
ring on rivets	do	40,310

lciency of joint, 62.3 per cent.



H Ex 31 49 2

Areas.

s sectional area	square inches	10.624
ectional area	do	6.154
ing surface of rivets	do	4.470
aring area	do	9.425

[Steel rivets.]

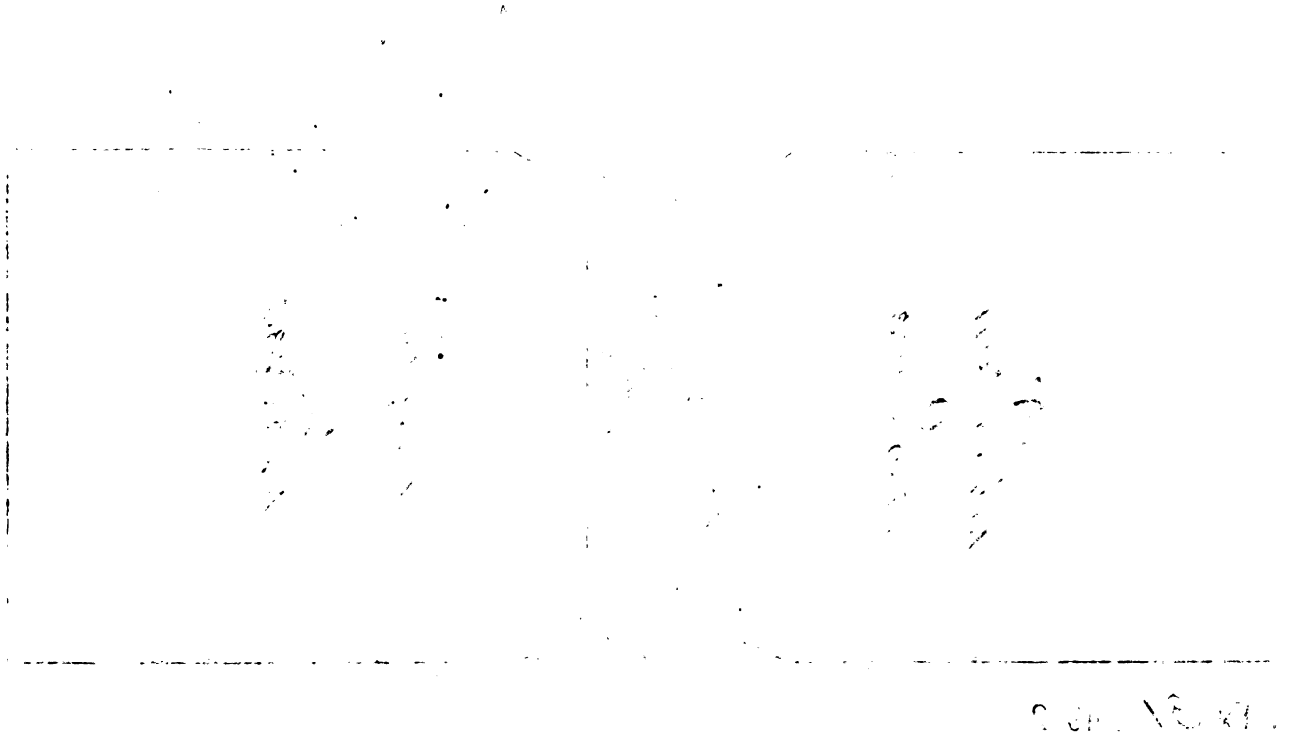
lied loads.		In gauged length.		Remarks.
	Per square inch.	Elongation.	Set.	
	Pounds.	*Inch.*	*Inch.*	
	1,000	0.	0.	Initial load.
	2,000	.0000	.....	
	3,000	.0005	.....	
	4,000	.0008	.....	
	5,000	.0008	.0005	
	6,000	.0011	.....	
	7,000	.0021	.....	
	8,000	.0056	.....	
	9,000	.0066	.....	
	10,000	.0078	.0063	
	11,000	.0081	.....	
	12,000	.0088	.....	
	13,000	.0098	.....	
	14,000	.0104	.....	
	15,000	.0111	.0087	
	16,000	.0126	.....	
	17,000	.0139	.....	
	18,000	.0149	.....	
	19,000	.0161	.....	
	20,000	.0172	.0126	
	21,000	.0188	.....	
	22,000	.0206	.....	
	23,000	.0221	.....	
	24,000	.0246	.....	
	25,000	.0316	.0246	
	26,000	.0406	.....	
	27,000	.0481	.....	
	28,000	.0571	.....	
	29,000	.0661	.....	
	30,000	.0781	.0681	
	31,000	.0960	.....	
	32,000	.11	.....	
	33,000	.13	.....	
	34,000	.15	.....	
	35,000	.17	.....	
	36,000	.20	.....	
	37,000	.26	.....	
	38,000	.35	.....	
	38,120	.....	.....	Tensile strength.

ured plate along line of riveting.
arance, silky, lamellar. Open at edges ″.15 and ″.20.
at fracture (one section), 1″.14×″.49=.5586 square inch.
:action, 45.4 per cent.
;ation of rivet-holes, ″.56, ″.56, ″.58, ″.62, ″.68, ″.76.

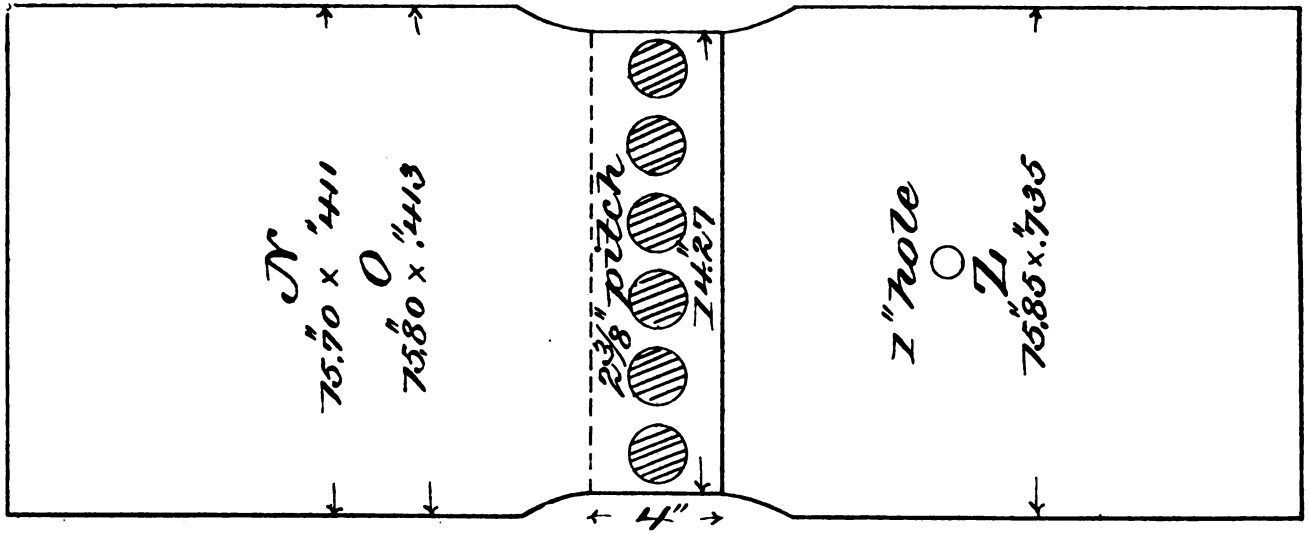
Maximum stress on joint.

gross section of plate	pounds per square inch	38,120
net section of plate	do	65,810
n on bearing surface of rivets	do	90,600
a rivets	do	42,970

y of joint, 64.6 per cent.



3/4" steel



H Ex 31 49 2

Areas.

sectional area	square inches	10.488
ctional area	do	6.078
g surface of rivets	do	4.410
ring area	do	9.425

ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0001	.....	
3,000	.0004	.....	
4,000	.0005	.....	
5,000	.0006	.0002	
6,000	.0010	.....	
7,000	.0057	.....	
8,000	.0067	.....	
9,000	.0074	.....	
10,000	.0081	.0071	
11,000	.0089	.....	
12,000	.0094	.....	
13,000	.0103	.....	
14,000	.0117	.....	
15,000	.0143	.0120	
16,000	.0157	.....	
17,000	.0169	.....	
18,000	.0177	.....	
19,000	.0187	.....	
20,000	.0198	.0158	
21,000	.0235	.....	
22,000	.0287	.....	
23,000	.0415	.....	
24,000	.0527	.....	
25,000	.0652	.0561	
26,000	.0782	.....	
27,000	.0912	.....	
28,000	.1060	.....	
29,000	.13	.....	
30,000	.16	.....	
31,000	.18	.....	
32,000	.21	.....	
33,000	.26	.....	
34,000	.31	.....	Tensile strength.

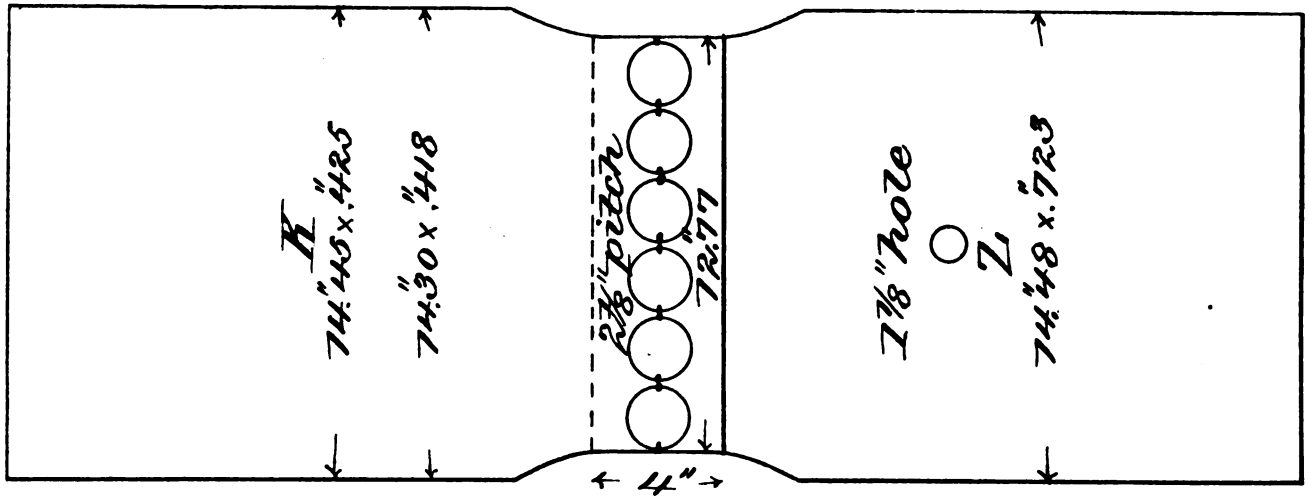
ed the rivets.
ation of rivet-holes, ″.14 each.

Maximum stress on joint.

gross section of plate	pounds per square inch	34,000
net section of plate	do	58,670
on bearing surface of rivets	do	80,860
rivets	do	37,830

of joint, 57.6 per cent.

No. 7490 3/4" steel plate



H Ex 31 49 2

Areas.

;ross sectional area	square inches	9.233
ıet sectional area	do	4.353
bearing surface of rivets	do	4.880
shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
ıds.	*Pounds.*	*Inch.*	*Inch.*	
233	1,000	0.	0.	Initial load.
466	2,000	.0001	.....	
699	3,000	.0003	.....	
932	4,000	.0006	.....	
165	5,000	.0018	.0014	
398	6,000	.0024	.....	
631	7,000	.0030	.....	
864	8,000	.0041	.....	
097	9,000	.0052	.....	
330	10,000	.0061	.0055	
563	11,000	.0074	.....	
796	12,000	.0084	.....	
029	13,000	.0097	.....	
262	14,000	.0111	.....	
495	15,000	.0134	.0104	
728	16,000	.0154	.....	
961	17,000	.0187	.....	
194	18,000	.0211	.....	
427	19,000	.0255	.....	
660	20,000	.0298	.0246	
893	21,000	.0344	.....	
126	22,000	.0403	.....	
359	23,000	.0494	.....	
592	24,000	.0590	.....	
825	25,000	.0720	.0641	
058	26,000	.0860	.....	
291	27,000	.1051	.....	
524	28,000	.12	.....	
757	29,000	.16	.....	
990	30,000	.19	.....	
223	31,000	.29	.....	
700	31,050	.34	.....	Tensile strength.

ıctured plate along line of riveting.
pearance, silky, very lamellar. Open at edges ″.15 and ″.10.
ɔngation of rivet-holes, ″.46, ″.48, ″.48, ″.50, ″.52, ″.48.
ea at fracture (one section), ″.81×″.48=.3888 square inch.
ıtraction, 46.2 per cent.

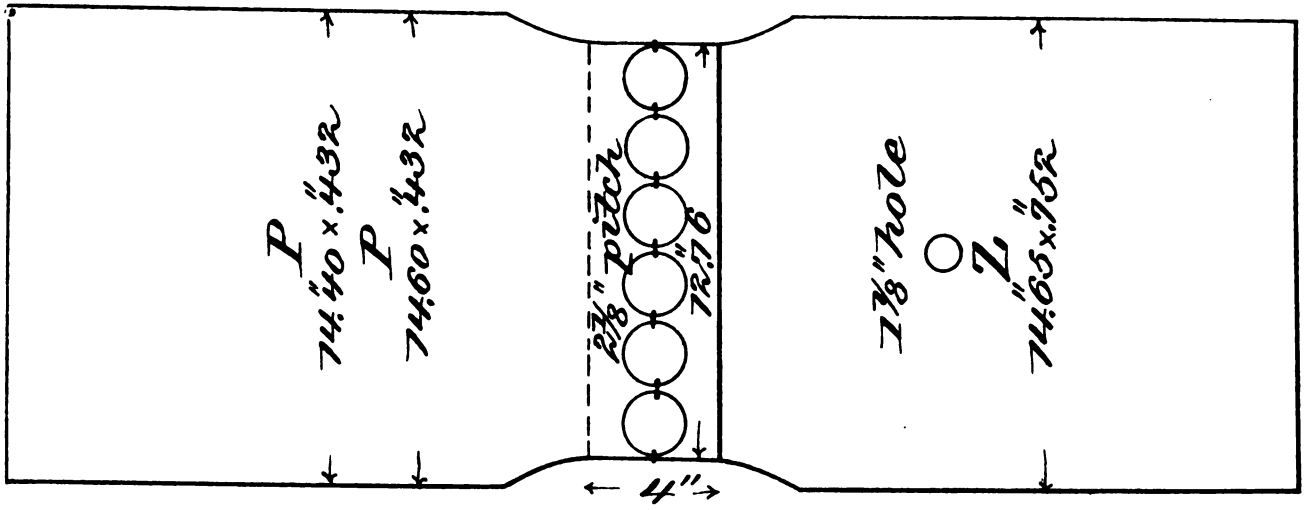
Maximum stress on joint.

ı on gross section of plate	pounds per square inch	31,050
ı on net section of plate	do	65,860
ıssion on bearing surface of rivets	do	58,750
g on rivets	do	24,030

ɔncy of joint, 52.6 per cent.

No. 7497

3/4" steel plate



H Ex 31 49 2

Areas.

ss sectional area	square inches	9.596
sectional area	do	4.530
ring surface of rivets	do	5.076
earing area	do	11.928

plied loads.		In gauged length.		Remarks.
.	Per square inch.	Elongation.	Set.	
s.	*Pounds.*	*Inch.*	*Inch.*	
	1,000	0.	0.	Initial load.
	2,000	.0005	.....	
	3,000	.0005	.....	
	4,000	.0007	.....	
	5,000	.0010	.0004	
	6,000	.0013	.....	
	7,000	.0018	.....	
	8,000	.0027	.....	
	9,000	.0058	.....	
	10,000	.0067	.0051	
	11,000	.0075	.....	
	12,000	.0080	.....	
	13,000	.0090	.....	
	14,000	.0102	.....	
	15,000	.0115	.0087	
	16,000	.0134	.....	
	17,000	.0149	.....	
	18,000	.0175	.....	
	19,000	.0197	.....	
	20,000	.0226	.0183	
	21,000	.0276	.....	
	22,000	.0321	.....	
	23,000	.0376	.....	
	24,000	.0468	.....	
	25,000	.0559	.0475	
	26,000	.0690	.....	
	27,000	.0843	.....	
	28,000	.1080	.....	
	29,000	.14	.....	
	30,000	.17	.....	
	31,000	.21	.....	
	32,000	.29	.....	Tensile strength.

tured plate along line of riveting.
earance, silky. Open at edges ″.15 and ″.05.
gation of rivet-holes, ″.50, ″.50, ″.48, ″.48, ″.45, ″.41.
, at fracture (one section), ″.84×″.51=.4282 square inch.
raction, 43.0 per cent.

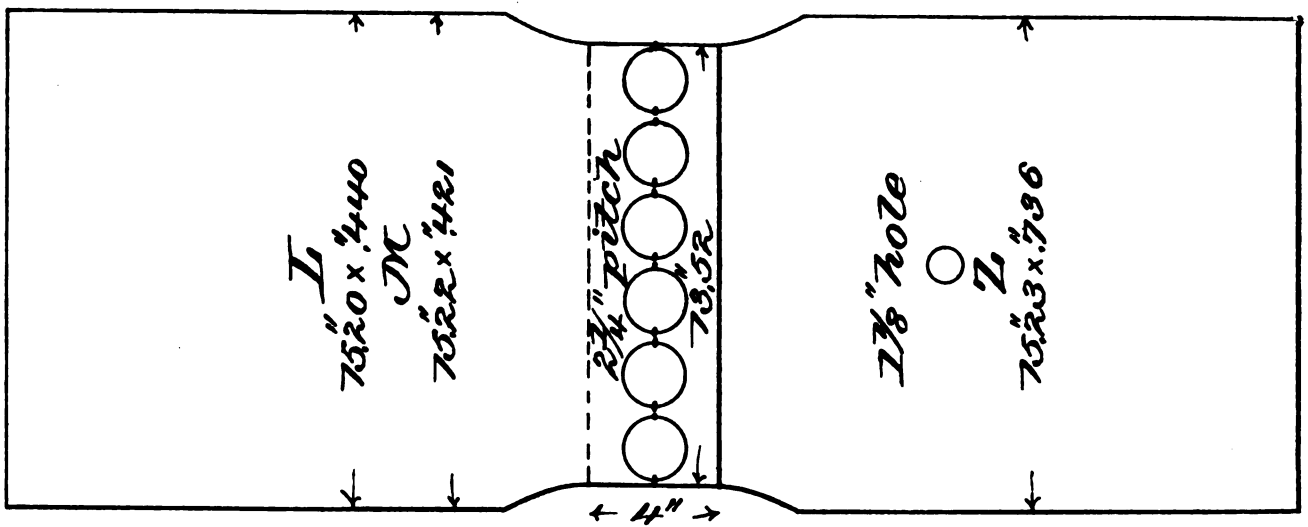
Maximum stress on joint.

n gross section of plate	pounds per square inch	32,000
n net section of plate	do	67,940
ion on bearing surface of rivets	do	65,340
on rivets	do	25,740

cy of joint, 54.2 per cent.

H Ex 3/8 48 2

No. 7492 3/4" steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches	9.951
Plate, net sectional area	do	4.983
Plate, bearing surface of rivets	do	4.968
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,951	1,000	0.	0.	Initial load.
19,902	2,000	.0000	.....	
29,853	3,000	.0001	.....	
39,804	4,000	.0002	.....	
49,755	5,000	.0006	.0008	
59,706	6,000	.0015	.....	
69,657	7,000	.0021	.....	
79,608	8,000	.0027	.....	
89,559	9,000	.0035	.....	
99,510	0,000	.0047	.0038	
109,461	11,000	.0058	.....	
119,412	12,000	.0067	.....	
129,363	13,000	.0076	.....	
139,314	14,000	.0085	.....	
149,265	15,000	.0097	.0078	
159,216	16,000	.0113	.....	
169,167	17,000	.0123	.....	
179,118	18,000	.0132	.....	
189,069	19,000	.0147	.....	
199,020	20,000	.0176	.0134	
208,971	21,000	.0220	.....	
218,922	22,000	.0243	.....	
228,873	23,000	.0292	.....	
238,824	24,000	.0364	.....	
248,775	25,000	.0510	.0430	
258,726	26,000	.0640	.....	
268,677	27,000	.0790	.....	
278,628	28,000	.0971	.....	
288,579	29,000	.1149	.....	
298,530	30,000	.14	.....	
308,481	31,000	.16	.....	
318,432	32,000	.19	.....	
328,383	33,000	.25	.....	
338,334	34,000	.30	.....	
341,000	34,270	.37	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar, seam across one section. Open at edges ″.05 and 0″.

Area at fracture (one section), ″.93×″.48=.4464 square inch.

Contraction, 46.0 per cent.

Elongation of rivet-holes, ″.49, ″.49, ″.49, ″.48, ″.50, ″.50.

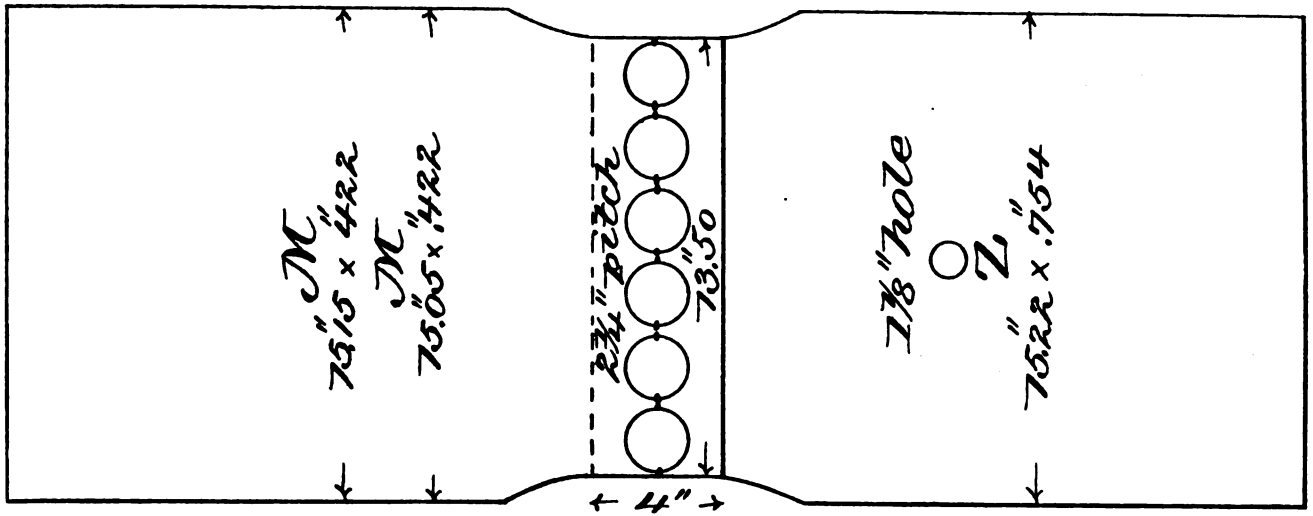
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,270
Tension on net section of plate	do	68,430
Compression on bearing surface of rivets	do	68,640
Shearing on rivets	do	28,590

Efficiency of joint, 58.0 per cent.

No. 7493

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	10.179
Plate, net sectional area	do	5.089
Plate, bearing surface of rivets	do	5.090
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,179	1,000	0.	0.	Initial load.
20,358	2,000	.0001	.....	
30,537	3,000	.0003	.....	
40,716	4,000	.0006	.....	
50,895	5,000	.0006	−.0001	
61,074	6,000	.0012	.....	
71,253	7,000	.0016	.....	
81,432	8,000	.0027	.....	
91,611	9,000	.0049	.....	
101,790	10,000	.0064	.0048	
111,969	11,000	.0083	.....	
122,148	12,000	.0092	.....	
132,327	13,000	.0100	.....	
142,506	14,000	.0114	.....	
152,685	15,000	.0120	.0190	
162,864	16,000	.0139	.....	
173,043	17,000	.0153	.....	
183,222	18,000	.0168	.....	
193,401	19,000	.0188	.....	
203,580	20,000	.0218	.0156	
213,759	21,000	.0254	.....	
223,938	22,000	.0318	.....	
234,117	23,000	.0379	.....	
244,296	24,000	.0445	.....	
254,475	25,000	.0537	.0445	
264,654	26,000	.0663	.....	
274,833	27,000	.0790	.....	
285,012	28,000	.0960	.....	
295,191	29,000	.1140	.....	
305,370	30,000	.14	.....	
315,549	31,000	.16	.....	
325,728	32,000	.19	.....	
335,907	33,000	.25	.....	
343,700	33,770	.33	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.15.
Elongation of rivet-holes, ″.52, ″.48, ″.47, ″.47, ″.49, ″.53.
Area at fracture (one section), ″.95×″.52=.4940 square inch.
Contraction, 41.7 per cent.

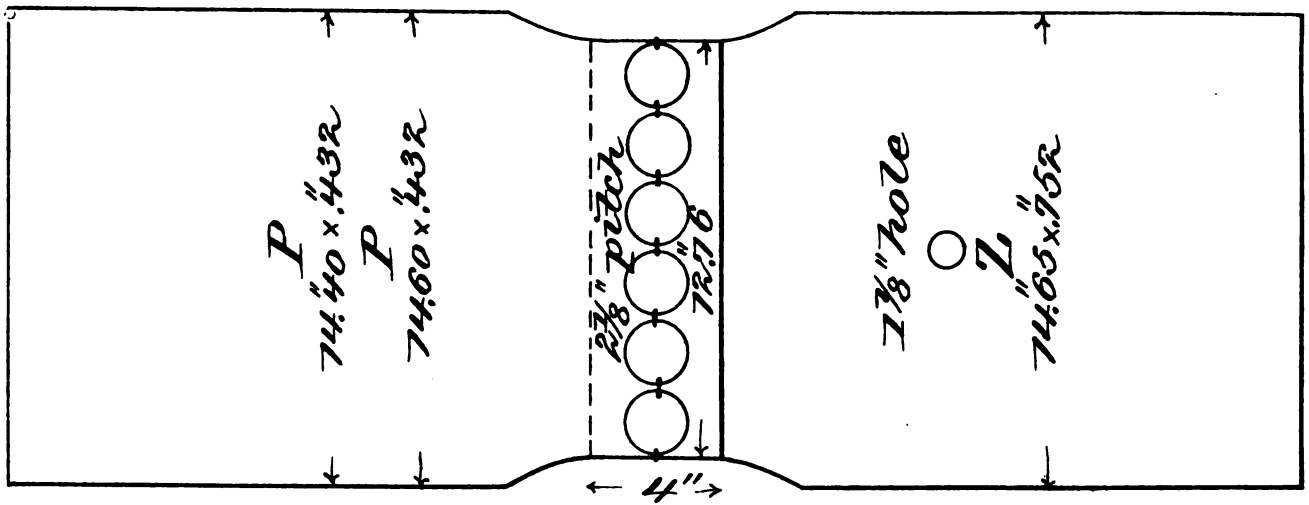
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	33,770
Tension on net section of plate	do	67,540
Compression on bearing surface of rivets	do	67,520
Shearing on rivets	do	28,810

Efficiency of joint, 57.2 per cent.

No. 7497

3/4" steel plate



H Ex 31 49 2

Areas.

ss sectional area	square inches..	9.596
sectional area	do....	4.520
ring surface of rivets	do....	5.076
earing area	do....	11.928

plied loads.		In gauged length.		Remarks.
.	Per square inch.	Elongation.	Set.	
s.	*Pounds.*	*Inch.*	*Inch.*	
3	1,000	0.	0.	Initial load.
2	2,000	.0005	.....	
8	3,000	.0005	.....	
4	4,000	.0007	.....	
0	5,000	.0010	.0004	
6	6,000	.0013	.....	
2	7,000	.0018	.....	
8	8,000	.0027	.....	
4	9,000	.0058	.....	
0	10,000	.0067	.0051	
6	11,000	.0075	.....	
2	12,000	.0080	.....	
8	13,000	.0090	.....	
4	14,000	.0102	.....	
0	15,000	.0115	.0087	
6	16,000	.0134	.....	
2	17,000	.0149	.....	
8	18,000	.0175	.....	
4	19,000	.0197	.....	
0	20,000	.0226	.0183	
6	21,000	.0276	.....	
2	22,000	.0321	.....	
8	23,000	.0376	.....	
4	24,000	.0468	.....	
0	25,000	.0559	.0475	
6	26,000	.0690	.....	
2	27,000	.0843	.....	
8	28,000	.1080	.....	
4	29,000	.14	.....	
0	30,000	.17	.....	
6	31,000	.21	.....	
2	32,000	.29	.....	Tensile strength.

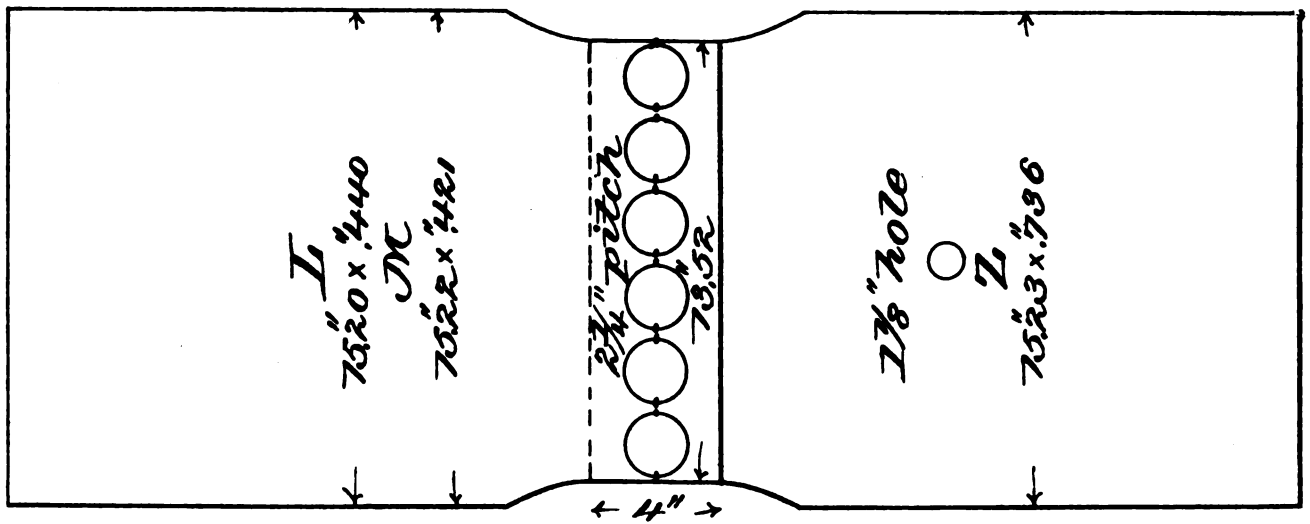
tured plate along line of riveting.
earance, silky. Open at edges ″.15 and ″.05.
gation of rivet-holes, ″.50, ″.50, ″.48, ″.48, ″.45, ″.41.
at fracture (one section), ″.84×″.51=.4282 square inch.
raction, 43.0 per cent.

Maximum stress on joint.

n gross section of plate	pounds per square inch..	32,000
n net section of plate	do....	67,940
ion on bearing surface of rivets	do....	65,340
on rivets	do....	25,740

cy of joint, 54.2 per cent.

No. 7492 3/4" steel plate



H Ex 31 492

Seam No.
Seam Allowance
Ex 31 49 2
H
L
76.20 x .440
76.52 x .421
24" Pitch
73.52
4"
24" Pole
Circ.
46.06

H Ex 31 49 2

74 steel pc

Areas.

), gross sectional area	square inches	9.951
), net sectional area	do	4.983
), bearing surface of rivets	do	4.968
ts, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,951	1,000	0.	0.	Initial load.
19,902	2,000	.0000	.....	
29,853	3,000	.0001	.....	
39,804	4,000	.0002	.....	
49,755	5,000	.0006	.0003	
59,706	6,000	.0015	.....	
69,657	7,000	.0021	.....	
79,608	8,000	.0027	.....	
89,559	9,000	.0035	.....	
99,510	10,000	.0047	.0038	
09,461	11,000	.0058	.....	
19,412	12,000	.0067	.....	
29,363	13,000	.0076	.....	
39,314	14,000	.0085	.....	
49,265	15,000	.0097	.0078	
59,216	16,000	.0113	.....	
69,167	17,000	.0123	.....	
79,118	18,000	.0132	.....	
89,069	19,000	.0147	.....	
99,020	20,000	.0176	.0134	
08,971	21,000	.0220	.....	
18,922	22,000	.0243	.....	
28,873	23,000	.0292	.....	
38,824	24,000	.0364	.....	
48,775	25,000	.0510	.0430	
58,726	26,000	.0640	.....	
68,677	27,000	.0790	.....	
78,628	28,000	.0971	.....	
8,579	29,000	.1149	.....	
8,530	30,000	.14	.....	
3,481	31,000	.16	.....	
,432	32,000	.19	.....	
,383	33,000	.25	.....	
334	34,000	.30	.....	
000	34,270	.37	.....	Tensile strength.

ctured plate along line of riveting.

pearance, silky, lamellar, seam across one section. Open at edges nd 0″.

a at fracture (one section), ″.93×″.48=.4464 square inch.

raction, 46.0 per cent.

gation of rivet-holes, ″.49, ″.49, ″.49, ″.48, ″.50, ″.50.

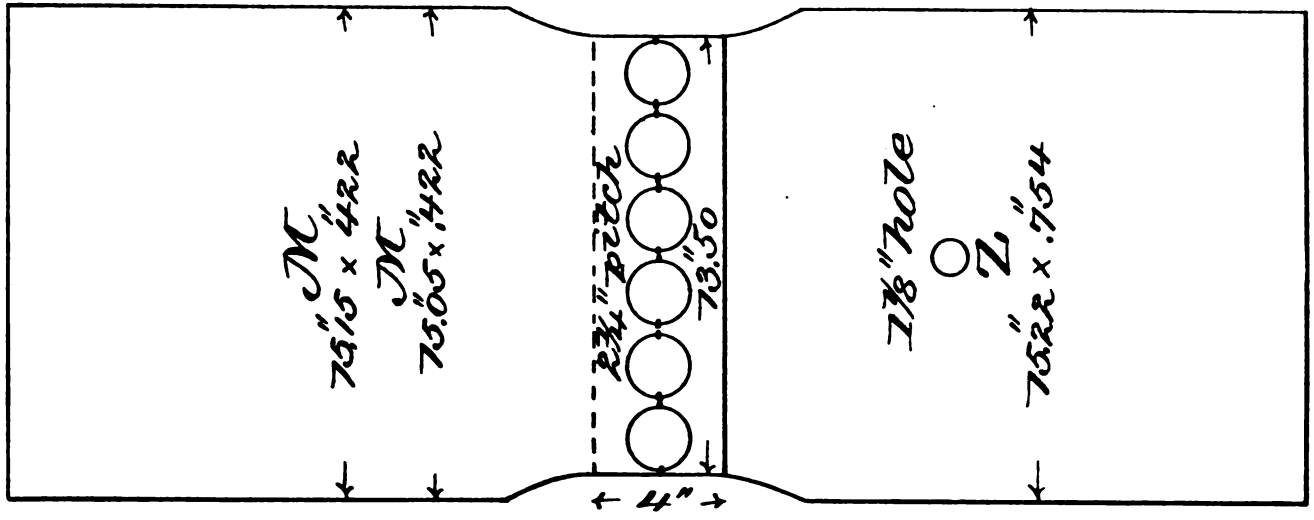
Maximum stress on joint.

gross section of plate	pounds per square inch	34,270
net section of plate	do	68,430
n on bearing surface of rivets	do	68,640
rivets	do	28,500

of joint, 58.0 per cent.

No. 7493

3/4" steel plate



H Ex 31 49 2

Areas.

ıss sectional area	square inches..	11.175
; sectional area	do....	6.146
ıring surface of rivets	do....	5.029
ıearing area	do....	11.928

›plied loads.		In gauged length.		Remarks.
ıl.	Per square inch.	Elongation.	Set.	
ds	*Pounds.*	*Inch.*	*Inch.*	
75	1,000	0.	0.	Initial load.
50	2,000	.0001	.....	
25	3,000	.0002	.....	
00	4,000	.0003	.....	
75	5,000	.0008	.0005	
50	6,000	.0010	.....	
25	7,000	.0022	.....	
00	8,000	.0036	.....	
75	9,000	.0051	.....	
50	10,000	.0065	.0054	
25	11,000	.0074	.....	
00	12,000	.0078	.....	
75	13,000	.0090	.....	
50	14,000	.0106	.....	
25	15,000	.0121	.0099	
00	16,000	.0138	.....	
75	17,000	.0152	.....	
50	18,000	.0164	.....	
25	19,000	.0179	.....	
00	20,000	.0192	.0155	
75	21,000	.0219	.....	
50	22,000	.0245	.....	
25	23,000	.0299	.....	
00	24,000	.0433	.....	
75	25,000	.0570	.0480	
00	26,000	.0668	.....	
75	27,000	.0785	.....	
00	28,000	.0902	.....	
75	29,000	.1065	.....	
00	30,000	.14	.....	
75	31,000	.16	.....	
00	32,000	.18	.....	
75	33,000	.22	.....	
00	34,000	.26	.....	
75	35,000	.28	.....	
00	36,000	.35	.....	
75	37,000	.38	.....	
00	38,000	.47	.....	
00	38,470	.54	.....	Tensile strength.

:tured plate along line of riveting.
earance, silky, slightly lamellar; 10 per cent. of one fractured
ı granular, and traces of granular metal in one other section.
ıt edges ″.25 and ″.15.
ıgation of rivet-holes, ″.66, ″.61, ″.57, ″.57, ″.60, ″.66.
ı at fracture (one section), 1″.22×″.51=.6222 square inch.
traction, 39.2 per cent.

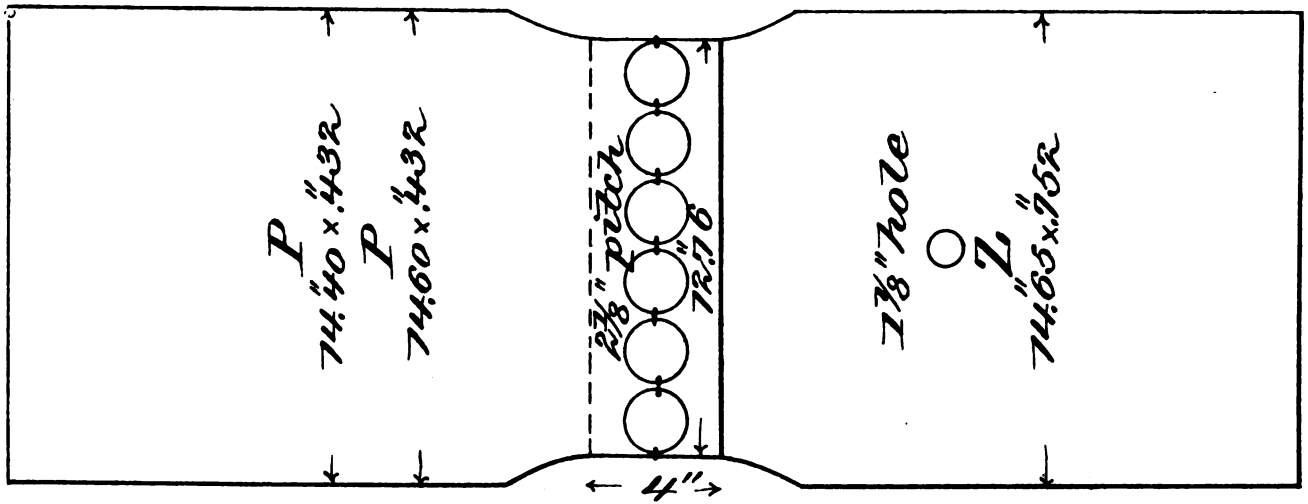
Maximum stress on joint.

›n gross section of plate	pounds per square inch..	38,470
›n net section of plate	do....	69,940
sion on bearing surface of rivets	do....	85,480
on rivets	do....	36,040

ıcy of joint, 63.6 per cent.

No. 7497

3/4" steel plate



H Ex 31 49 2

Areas.

ss sectional area	square inches	9.596
sectional area	do	4.520
ring surface of rivets	do	5.076
earing area	do	11.928

plied loads.		In gauged length.		Remarks.
.	Per square inch.	Elongation.	Set.	
's.	*Pounds.*	*Inch.*	*Inch.*	
5	1,000	0.	0.	Initial load.
2	2,000	.0005	.....	
8	3,000	.0005	.....	
4	4,000	.0007	.....	
0	5,000	.0010	.0004	
6	6,000	.0013	.....	
2	7,000	.0018	.....	
8	8,000	.0027	.....	
4	9,000	.0058	.....	
0	10,000	.0067	.0051	
6	11,000	.0075	.....	
2	12,000	.0080	.....	
8	13,000	.0090	.....	
4	14,000	.0102	.....	
0	15,000	.0115	.0087	
6	16,000	.0134	.....	
2	17,000	.0149	.....	
8	18,000	.0175	.....	
4	19,000	.0197	.....	
0	20,000	.0226	.0183	
6	21,000	.0276	.....	
2	22,000	.0321	.....	
8	23,000	.0376	.....	
4	24,000	.0468	.....	
0	25,000	.0559	.0475	
6	26,000	.0690	.....	
2	27,000	.0843	.....	
8	28,000	.1080	.....	
4	29,000	.14	.....	
0	30,000	.17	.....	
6	31,000	.21	.....	
2	32,000	.29	.....	Tensile strength.

tured plate along line of riveting.
earance, silky. Open at edges ″.15 and ″.05.
gation of rivet-holes, ″.50, ″.50, ″.48, ″.48, ″.45, ″.41.
at fracture (one section), ″.84×″.51=.4282 square inch.
raction, 43.0 per cent.

Maximum stress on joint.

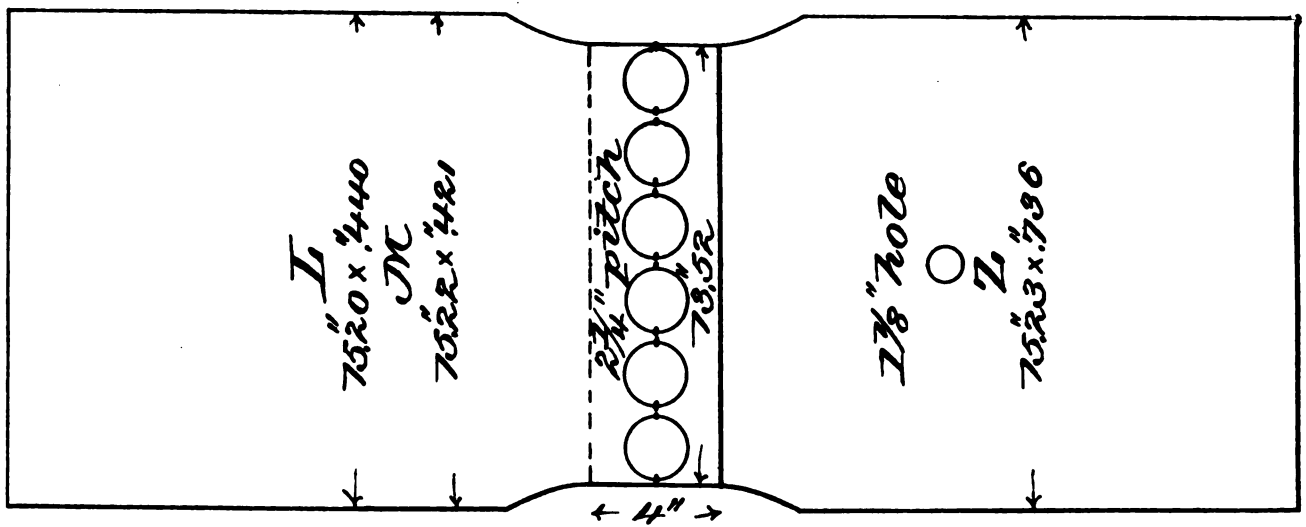
n gross section of plate	pounds per square inch	32,000
n net section of plate	do	67,949
ion on bearing surface of rivets	do	65,340
on rivets	do	25,740

cy of joint, 54.2 per cent.

Scale: No Scale
Scale: 1/4" = 1"
Exh. 31/ 49 2
M
15.25" x .140"
L
15.25" x .140"
13.25"
2 1/4" pitch
1/4"

No. 7492

3/4" steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches	9.951
Plate, net sectional area	do	4.983
Plate, bearing surface of rivets	do	4.968
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,951	1,000	0.	0.	Initial load.
19,902	2,000	.0000	.....	
29,853	3,000	.0001	.....	
39,804	4,000	.0003	.....	
49,755	5,000	.0006	.0003	
59,706	6,000	.0015	.....	
69,657	7,000	.0021	.....	
79,608	8,000	.0027	.....	
89,559	9,000	.0035	.....	
99,510	10,000	.0047	.0038	
109,461	11,000	.0058	.....	
119,412	12,000	.0067	.....	
129,363	13,000	.0076	.....	
139,314	14,000	.0085	.....	
149,265	15,000	.0097	.0078	
159,216	16,000	.0113	.....	
169,167	17,000	.0123	.....	
179,118	18,000	.0132	.....	
189,069	19,000	.0147	.....	
199,020	20,000	.0176	.0134	
208,971	21,000	.0220	.....	
218,922	22,000	.0243	.....	
228,873	23,000	.0292	.....	
238,824	24,000	.0364	.....	
248,775	25,000	.0510	.0430	
258,726	26,000	.0640	.....	
268,677	27,000	.0790	.....	
278,628	28,000	.0971	.....	
288,579	29,000	.1149	.....	
298,530	30,000	.14	.....	
308,481	31,000	.16	.....	
318,432	32,000	.19	.....	
328,383	33,000	.25	.....	
338,334	34,000	.30	.....	
341,000	34,270	.37	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar, seam across one section. Open at edges ″.05 and 0″.

Area at fracture (one section), ″.93×″.48=.4464 square inch.

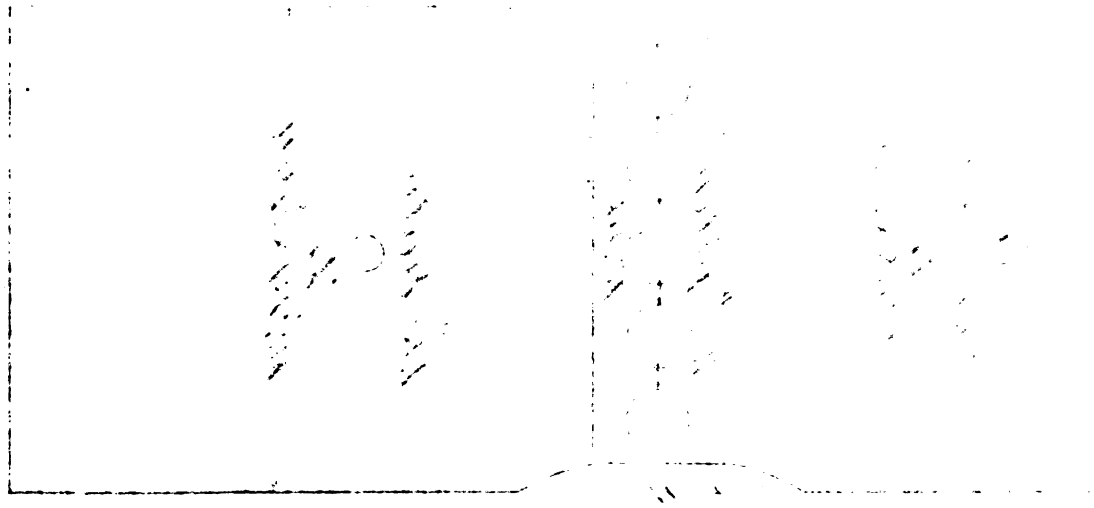
Contraction, 46.0 per cent.

Elongation of rivet-holes, ″.49, ″.49, ″.49, ″.48, ″.50, ″.50.

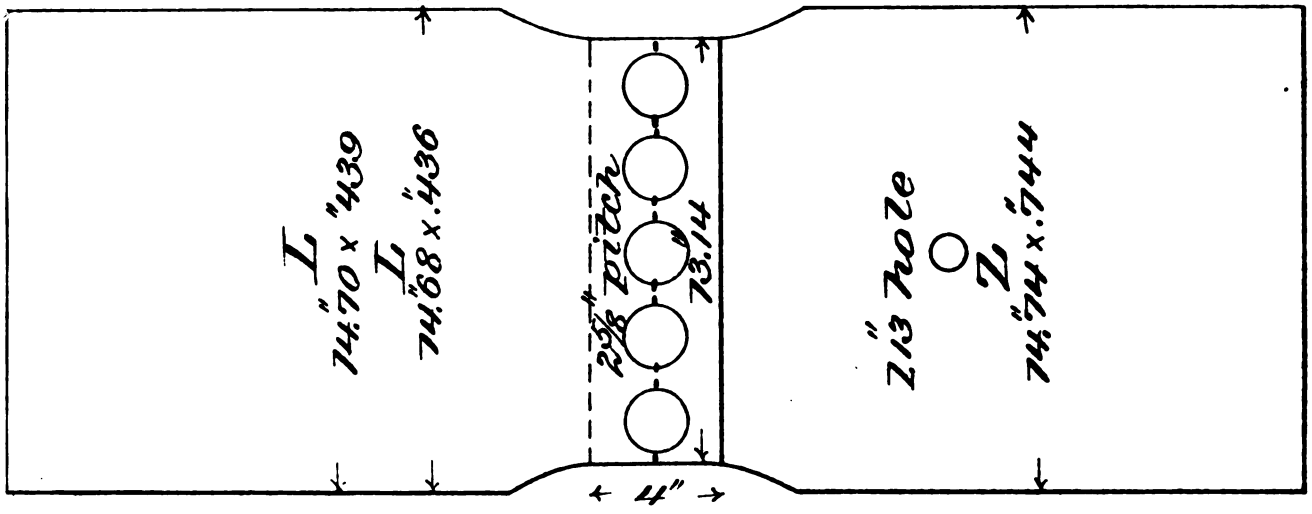
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,270
Tension on net section of plate	do	68,430
Compression on bearing surface of rivets	do	68,640
Shearing on rivets	do	28,500

Efficiency of joint, 58.0 per cent.



No. 1499 3/4" steel plate



H Ex 31 49 2

Areas.

oss sectional area	square inches	9.776
t sectional area	do	5.572
aring surface of rivets	do	4.204
hearing area	do	10,030

pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
76	1,000	0.	0.	Initial load.
52	2,000	.0001	.....	
28	3,000	.0002	.....	
04	4,000	.0003	.....	
80	5,000	.0004	.0003	
56	6,000	.0010	.....	
32	7,000	.0021	.....	
08	8,000	.0031	.....	
84	9,000	.0036	.....	
60	10,000	.0052	.0043	
36	11,000	.0062	.....	
12	12,000	.0079	.....	
88	13,000	.0090	.....	
64	14,000	.0103	.....	
40	15,000	.0113	.0104	
16	16,000	.0121	.....	
92	17,000	.0128	.....	
68	18,000	.0138	.....	
44	19,000	.0177	.....	
20	20,000	.0194	.0176	
96	21,000	.0263	.....	
72	22,000	.0327	.....	
48	23,000	.0465	.....	
24	24,000	.0588	.....	
00	25,000	.0728	.....	
76	26,000	.0917	.....	
52	27,000	.1021	.....	
28	28,000	.13	.....	
04	29,000	.15	.....	
80	30,000	.18	.....	
56	31,000	.21	.....	
32	32,000	.24	.....	
08	33,000	.30	.....	
84	34,000	.35	.....	
60	35,000	.40	.....	
36	36,000	51	.....	
50	36,470	.61	.....	Tensile strength.

ctured plate along line of riveting.
earance, silky. Open at edges ″.15 and ″.10.
ngation of rivet-holes, ″.70, ″.70, ″.70, ″.70, ″.72.
a at fracture (one section), 1″.24×″.46=.5704 square inch.
traction, 48.8 per cent.

Maximum stress on joint.

on gross section of plate	pounds per square inch	36,470
on net section of plate	do	63,900
sion on bearing surface of rivets	do	84,810
on rivets	do	35,550

ncy of joint, 61.7 per cent.

HEX 65 15

H Ex 31 49 2

Areas.

ıs sectional area	square inches..	10.478
sectional area	do....	6.192
ring surface of rivets	do....	4.286
earing area	do....	9.940

[Steel rivets.]

›lied loads.		In gauged length.		Remarks.
.	Per square inch.	Elongation.	Set.	
s.	*Pounds.*	*Inch.*	*Inch.*	
;	1,000	0.	0.	Initial load.
;	2,000	.0002	.....	
;	3,000	.0004	.....	
;	4,000	.0010	.....	
)	5,000	.0026	.0021	
;	6,000	.0053	.....	
;	7,000	.0075	.....	
;	8,000	.0092	.....	
;	9,000	.0105	.....	
)	10,000	.0115	.0100	
;	11,000	.0127	.....	
;	12,000	.0140	.....	
;	13,000	.0152	.....	
;	14,000	.0164	.....	
)	15,000	.0187	.0168	
;	16,000	.0202	.....	
;	17,000	.0223	.....	
;	18,000	.0238	.....	
;	19,000	.0256	.....	
)	20,000	.0287	.0269	
;	21,000	.0318	.....	
;	22,000	.0358	.....	
;	23,000	.0415	.....	
;	24,000	.0508	.....	
;	25,000	.0593	.....	
;	26,000	.0692	.....	
;	27,000	.0778	.....	
;	28,000	.0872	.....	
;	29,000	.0975	.....	
;	30,000	.1140	.....	
;	31,000	.13	.....	
;	32,000	.15	.....	
;	33,000	.17	.....	
;	34,000	.19	.....	
;	35,000	.21	.....	
;	36,000	.25	.....	
;	37,000	.29	.....	
;	38,000	.37	.....	
;	38,760	.54	.....	Tensile strength.

ıured plate along line of riveting.
ıarance, silky, slightly lamellar.
ɣation of rivet-holes, ″.65, ″.67, ″.66, ″.63, ″.59.
at fracture (one section), 1″.42×″.50=.710 square inch.
ʿaction, 42.6 per cent.

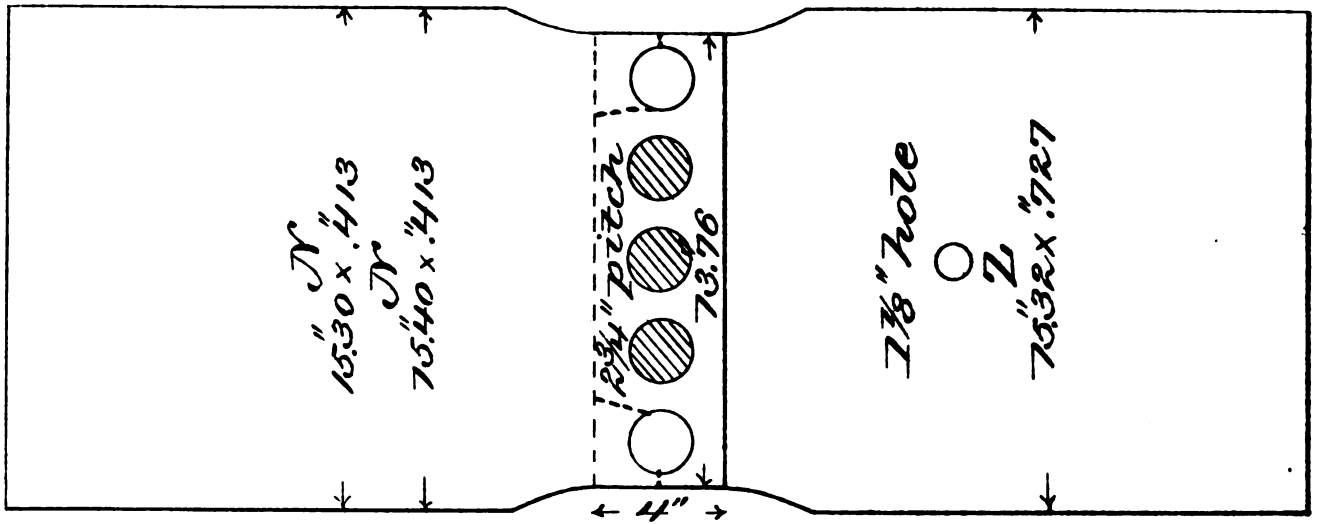
Maximum stress on joint.

gross section of plate	pounds per square inch..	38,760
net section of plate	do....	65,590
›n on bearing surface of rivets	do....	94,750
ı rivets	do....	40,850

y of joint, 65.7 per cent.

No. 1501

3/4" steel plate



H Ex 31 49 2

Areas.

ss sectional area	square inches	10.004
sectional area	do	5.915
ring surface of rivets	do	4.089
ıearing area	do	9.940

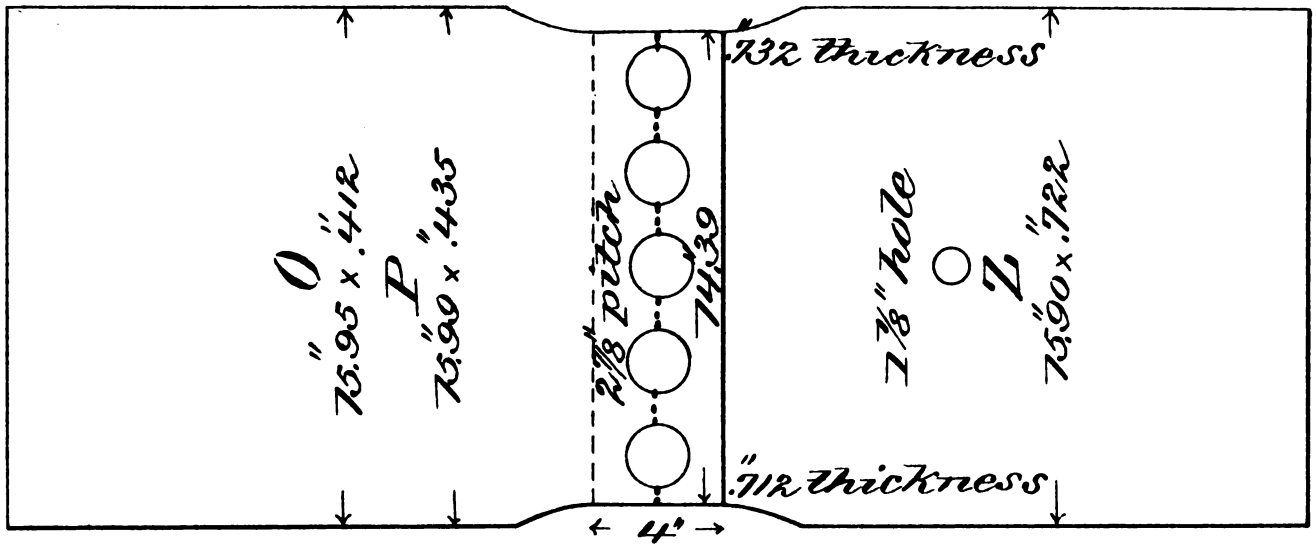
plied loads.		In ganged length.		Remarks.
l.	Per square inch.	Elongation.	Set.	
ls.	*Pounds.*	*Inch.*	*Inch.*	
4	1,000	0.	0.	Initial load.
8	2,000	.0000	.....	
2	3,000	.0001	.....	
6	4,000	—.0001	.....	
0	5,000	.0002	—.0001	
4	6,000	.0008	.....	
8	7,000	.0064	.....	
2	8,000	.0080	.....	
6	9,000	.0092	.0081	
0	10,000	.0101	.....	
4	11,000	.0109	.....	
8	12,000	.0121	.....	
2	13,000	.0136	.....	
6	14,000	.0154	.0128	
0	15,000	.0154	.0128	
4	16,000	.0171	.....	
8	17,000	.0189	.....	
2	18,000	.0211	.....	
6	19,000	.0242	.....	
0	20,000	.0286	.0231	Rested under load 10 minutes.
4	21,000	.0451	.....	
8	22,000	.0550	.....	
2	23,000	.0689	.....	
6	24,000	.0800	.....	
0	25,000	.0975	.0890	
4	26,000	.1145	.....	
8	27,000	.13	.....	
2	28,000	.15	.....	
6	29,000	.17	.....	
0	30,000	.22	.....	
4	31,000	.26	.....	
8	32,000	.29	.....	
2	33,000	.34	.....	
6	34,000	.41	.....	
0	35,000	.48	.....	
4	36,000	.58	.....	
0	36,740	.73	.....	Tensile strength.

ıred three rivets and fractured plate at end sections.
ıearance of fractures, silky.
ıgation of rivet-holes (″.58, ″.52, ″.56; sheared rivets in these , ″.76.

Maximum stress on joint.

on gross section of plate	pounds per square inch	36,740
on net section of plate	do	62,130
sion on bearing surface of rivets	do	89,880
on rivets	do	36,970

ıcy of joint, 62.2 per cent.


O
.412"
75.95 x
P
.435"
75.90 x
2 7/8" pitch
74.39
.732" thickness
7 7/8" hole
Z
.722"
75.90 x
.712" thickness
4'

H Ex 31 49 2

Areas.

oss sectional area	square inches	10.390
t sectional area	do	6.329
aring surface of rivets	do	4.061
hearing area	do	9.940

[Steel rivets.]

pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
90	1,000	0.	0.	Initial load.
80	2,000	.0007	.....	
70	3,000	.0013	.....	
60	4,000	.0015	.....	
50	5,000	.0032	.0030	
40	6,000	.0060	.....	
20	7,000	.0079	.....	
20	8,000	.0090	.....	
10	9,000	.0102	.....	
00	10,000	.0117	.0097	
90	11,000	.0137	.....	
80	12,000	.0151	.....	
70	13,000	.0162	.....	
60	14,000	.0178	.....	
50	15,000	.0200	.0154	
40	16,000	.0217	.....	
30	17,000	.0226	.....	
20	18,000	.0234	.....	
10	19,000	.0250	.....	
00	20,000	.0284	.0223	
90	21,000	.0347	.....	
80	22,000	.0417	.....	
70	23,000	.0504	.....	
60	24,000	.0607	.....	
50	25,000	.0701	.0610	
40	26,000	.0843	.....	
30	27,000	.0957	.....	
20	28,000	.1130	.....	
10	29,000	.1280	.....	
00	30,000	.14	.....	
90	31,000	.18	.....	
80	32,000	.20	.....	
70	33,000	.22	.....	
60	34,000	.25	.....	
50	35,000	.29	.....	
40	36,000	.36	.....	
30	37,000	.46	.....	
00	37,930	.....	.....	Tensile strength.

ctured plate along line of riveting.
earance, silky, slightly lamellar.
at fracture (one section), 1″.50×″.43=.645 square inch.
traction, 48.1 per cent.
gation of rivet-holes, ″.85, ″.74, ″.73, ″.74, ″.68.

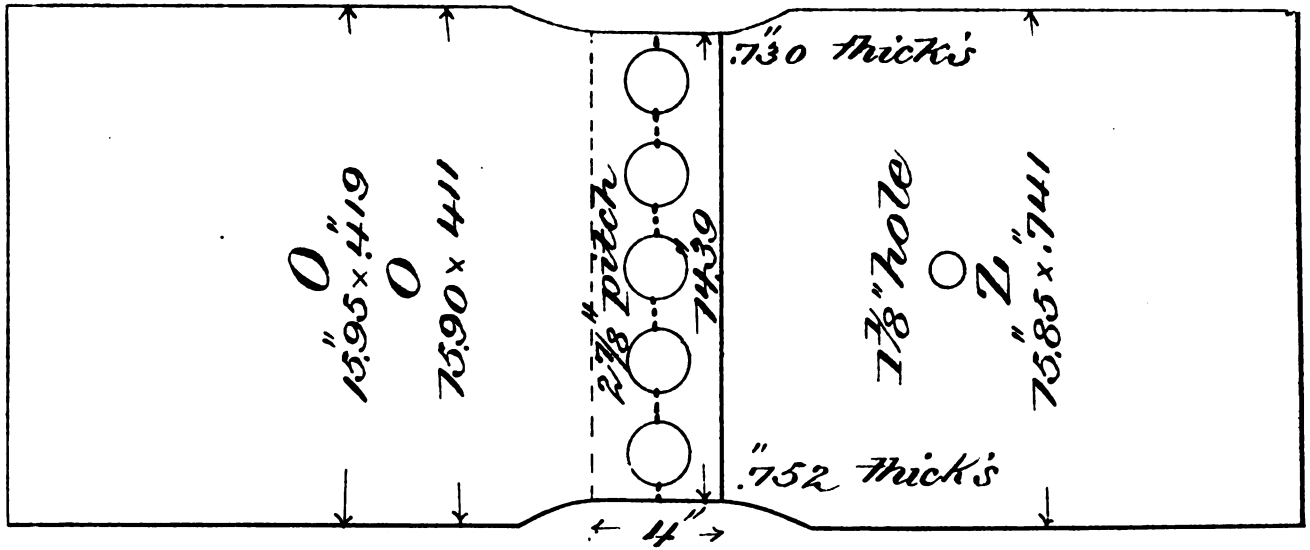
Maximum stress on joint.

n gross section of plate	pounds per square inch	37,930
n net section of plate	do	62,270
ion on bearing surface of rivets	do	97,050
on rivets	do	39,650

cy of joint, 64.3 per cent.

No. 7503

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	10.663
Plate, net sectional area	do	6.495
Plate, bearing surface of rivets	do	4.168
Rivets, shearing area	do	9.940

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,663	1,000	0.	0.	Initial load.
21,326	2,000	.0003	.....	
31,989	3,000	.0008	.....	
42,652	4,000	.0015	.....	
53,315	5,000	.0035	.0027	
63,978	6,000	.0067	.....	
74,641	7,000	.0075	.....	
85,304	8,000	.0087	.....	
95,967	9,000	.0099	.....	
106,630	10,000	.0115	.0093	
117,293	11,000	.0131	.....	
127,956	12,000	.0150	.....	
138,619	13,000	.0162	.....	
149,282	14,000	.0175	.....	
159,945	15,000	.0190	.0147	
170,608	16,000	.0202	.....	
181,271	17,000	.0212	.....	
191,934	18,000	.0226	.....	
202,597	19,000	.0243	.....	
213,260	20,000	.0254	.0191	
223,923	21,000	.0279	.....	
234,586	22,000	.0302	.....	
245,249	23,000	.0330	.....	
255,912	24,000	.0372	.....	
266,575	25,000	.0447	.0375	
277,238	26,000	.0579	.....	
287,901	27,000	.0694	.....	
298,564	28,000	.0811	.....	
309,227	29,000	.0933	.....	
319,890	30,000	.1056	.0960	
330,553	31,000	.1258	.....	
341,216	32,000	.14	.....	
351,879	33,000	.17	.....	
362,542	34,000	.19	.....	
373,205	35,000	.21	.....	
383,868	36,000	.26	.....	
394,531	37,000	.29	.....	
405,194	38,000	.36	.....	
415,857	39,000	.41	.....	
426,520	40,000	.50	.....	
433,200	40,630	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky.
Area at fracture (one section), 1″.49×″.47=.6003 square inch.
Contraction, 53.7 per cent.
Elongation of rivet-holes, ″.82, ″.72, ″.75, ″.89, ″.71.

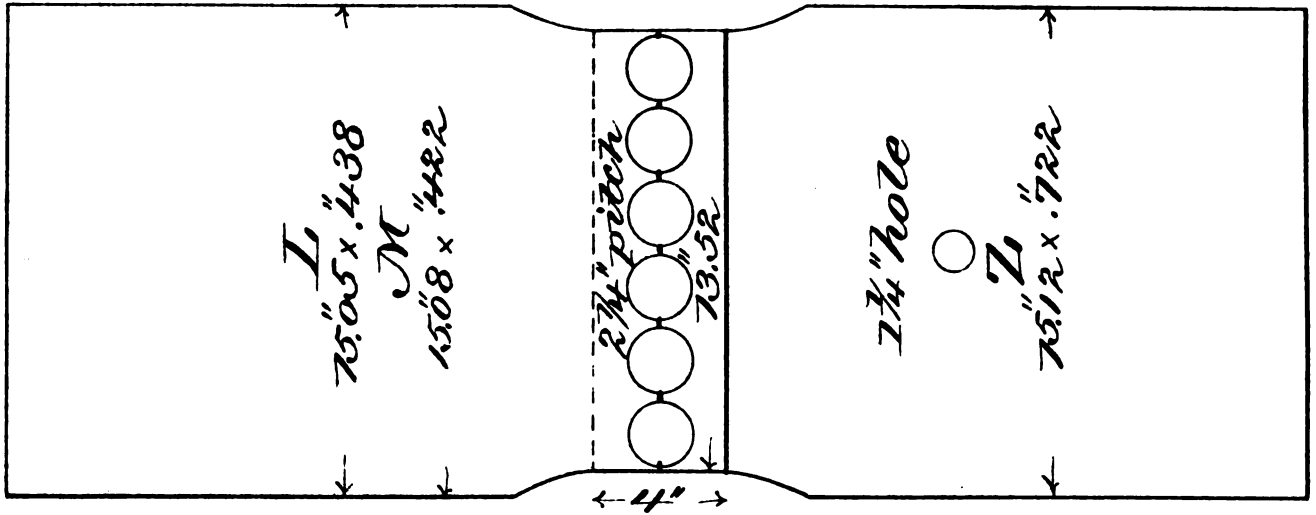
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	40,630
Tension on net section of plate	do	65,810
Compression on bearing surface of rivets	do	90,600
Shearing on rivets	do	42,970

Efficiency of joint, 68.8 per cent.

No. 1504

3/4" steel plate



H Ex 31 492

Areas.

;ross sectional area	square inches..	9.761
ıet sectional area	do....	4.346
ıearing surface of rivets	do....	5.415
shearing area	do....	14.726

ıpplied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
;nds.	*Pounds.*	*Inch.*	*Inch.*	
761	1,000	0.	0.	Initial load.
522	2,000	.0001	.....	
283	3,000	.0001	.....	
044	4,000	.0001	.....	
805	5,000	.0003	.0001	
566	6,000	.0027	.....	
327	7,000	.0064	.....	
088	8,000	.0082	.....	
849	9,000	.0091	.....	
610	10,000	.0099	.0092	
371	11,000	.0113	.....	
132	12,000	.0121	.....	
893	13,000	.0131	.....	
654	14,000	.0145	.....	
415	15,000	.0167	.0142	
176	16,000	.0188	.....	
937	17,000	.0206	.....	
698	18,000	.0224	.....	
459	19,000	.0251	.....	
220	20,000	.0331	.0276	
981	21,000	.0426	.....	
742	22,000	.0507	.....	
503	23,000	.0622	.....	
264	24,000	.0750	.....	
025	25,000	.0918	.0827	
786	26,000	.1135	.....	
547	27,000	.15	.....	
308	28,000	.18	.....	
069	29,000	.25	.....	
000	29,090	.33	.....	Tensile strength.

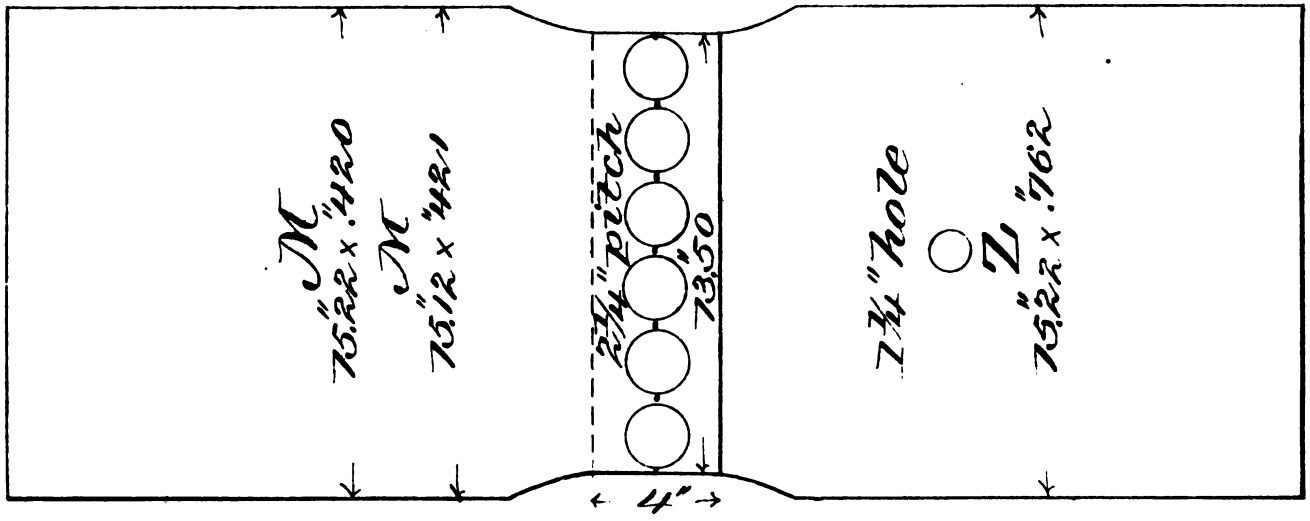
ıctured plate along line of riveting.
pearance, silky, slightly lamellar. Open at edges ″.12 and ″.15.
ıngation of rivet-holes, ″.55, ″.55, ″.53, ″.53, ″.52, ″.52.
ea at fracture (one section), ″.78×″.46=.3588 square inch.
ıtraction, 50.3 per cent.

Maximum stress on joint.

ı on gross section of plate	pounds per square inch..	29,090
ı on net section of plate	do....	65,350
ssion on bearing surface of rivets	do....	52,460
g on rivets	do....	19,280

ıncy of joint, 49.3 per cent.

No. 7505 3/4" steel plate



H Ex 31 49 2

Areas.

;ross sectional area	square inches..	10.287
ıet sectional area	do....	4.572
›earing surface of rivets	do....	5.715
shearing area	do....	14.726

ıpplied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
287	1,000	0.	0.	Initial load.
574	2,000	.0003	.....	
861	3,000	.0009	.....	
148	4,000	.0012	.....	
435	5,000	.0018	.0016	
722	6,000	.0047	.....	
009	7,000	.0066	.....	
296	8,000	.0076	.....	
583	9,000	.0100	.....	
870	10,000	.0121	.0107	
157	11,000	.0137	.....	
444	12,000	.0149	.....	
731	13,000	.0160	.....	
018	14,000	.0176	.....	
305	15,000	.0199	.0165	
592	16,000	.0219	.....	
879	17,000	.0235	.....	
166	18,000	.0252	.....	
453	19,000	.0289	.....	
740	20,000	.0350	.0292	
027	21,000	.0442	.....	
314	22,000	.0512	.....	
601	23,000	.0629	.....	
888	24,000	.0745	.....	
175	25,000	.0894	.0797	
462	26,000	.1132	.....	
749	27,000	.14	.....	
036	28,000	.16	.....	
323	29,000	.21	.....	
610	30,000	.30	.....	
680	30,010	.32	.....	Tensile strength.

actured plate along line of riveting.
›pearance, silky. Open at edges ″.03 and ″.05.
›ngation of rivet-holes, ″.50, ″.50, ″.48, ″.48, ″47, ″.47.
ea at fracture (one section), ″.82×″.50=.41 square inch.
ntraction, 46.1 per cent.

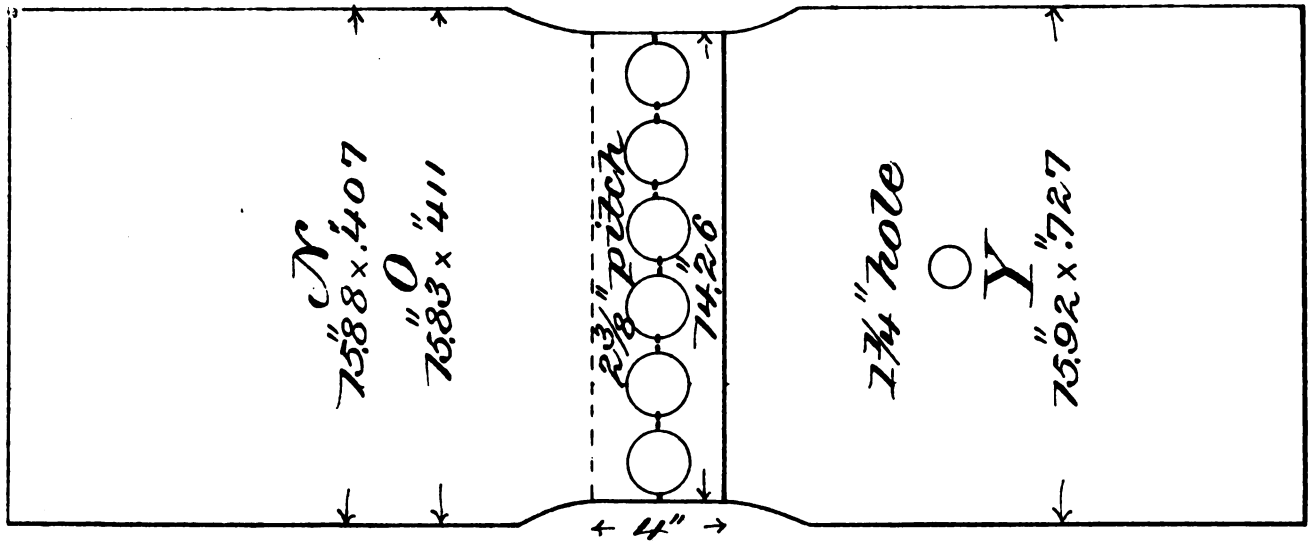
Maximum stress on joint.

ı on gross section of plate	pounds per square inch..	30,010
ı on net section of plate	do....	67,520
›ssion on bearing surface of rivets	do....	54,010
ıg on rivets	do....	20,960

ency of joint, 50.8 per cent.

No. 1506

3/4" steel plate



H Ex 31 49 2

Areas.

ross sectional area	square inches..	10.367
et sectional area	do....	4.914
earing surface of rivets	do....	5.453
shearing area	do....	14.726

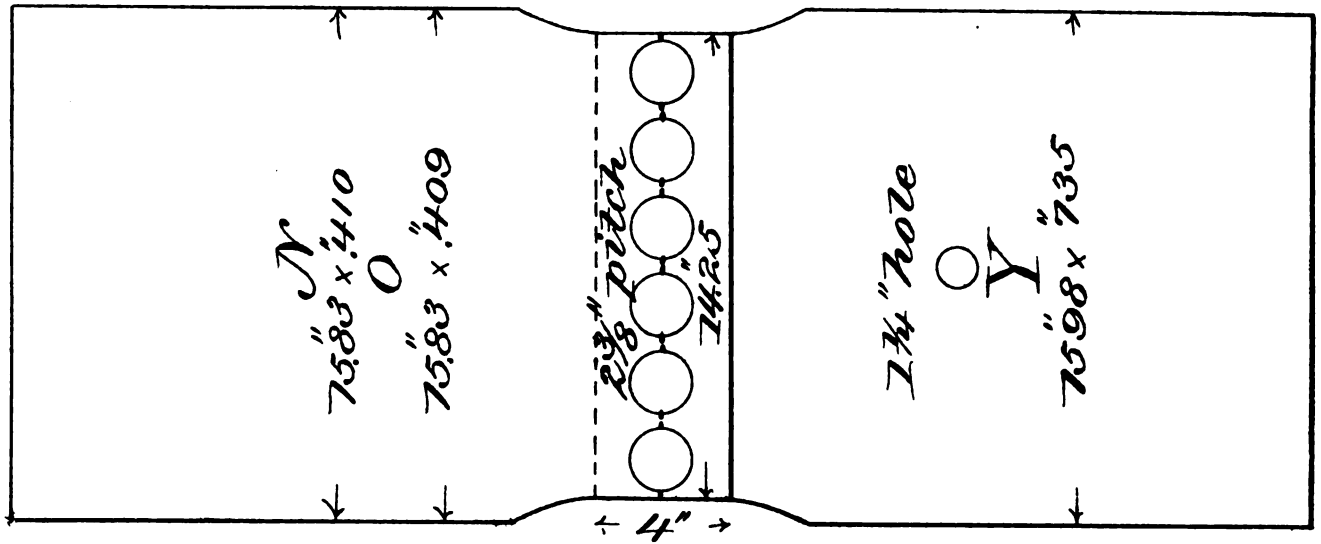
pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ıds.	*Pounds.*	*Inch.*	*Inch.*	
167	1,000	0.	0.	Initial load.
'34	2,000	.0001	.....	
01	3,000	.0004	.....	
168	4,000	.0009	.....	
135	5,000	.0046	.0045	
102	6,000	.0060	.....	
169	7,000	.0066	.....	
136	8,000	.0077	.....	
103	9,000	.0131	.....	
170	10,000	.0151	.0140	
137	11,000	.0165	.....	
104	12,000	.0176	.....	
171	13,000	.0186	.....	
138	14,000	.0195	.....	
105	15,000	.0205	.0177	
172	16,000	.0223	.....	
139	17,000	.0241	.....	
106	18,000	.0269	.....	
173	19,000	.0295	.....	
140	20,000	.0331	.0270	
107	21,000	.0391	.....	
174	22,000	.0457	.....	
141	23,000	.0550	.....	
108	24,000	.0640	.....	
175	25,000	.0741	.0649	
542	26,000	.0891	.....	
309	27,000	.1050	.....	
276	28,000	.1260	.....	
543	29,000	.15	.....	
310	30,000	.17	.....	
377	31,000	.20	.....	
744	32,000	.26	.....	
111	33,000	.29	.....	
400	33,610	.38	.....	Tensile strength.

ıctured plate along line of riveting.
pearance, silky, slightly lamellar.
ɔngation of rivet-holes, ″.47 each.
ea at fracture (one section), ″.94×″.50=.4700 square inch.
ntraction, 42.5 per cent.

Maximum stress on joint.

ı on gross section of plate	pounds per square inch..	32,610
ı on net section of plate	do....	70,900
ɔssion on bearing surface of rivets	do....	63,800
ıg on rivets	do....	23,600

ency of joint, 55.6 per cent.



H Ex 31 49 2

Areas.

oss sectional area	square inches..	10.474
t sectional area	do....	4.961
aring surface of rivets	do....	5.513
ihearing area	do....	14.726

pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
ds.	*Pounds.*	*Inch.*	*Inch.*	
74	1,000	0.	0.	Initial load.
48	2,000	—.0001	.....	
22	3,000	—.0001	.....	
96	4,000	.0000	.....	
70	5,000	.0005	.0005	
44	6,000	.0023	.....	
18	7,000	.0040	.....	
92	8,000	.0086	.....	
66	9,000	.0098	.....	
40	10,000	.0110	.0102	
14	11,000	.0121	.....	
88	12,000	.0129	.....	
62	13,000	.0137	.....	
36	14,000	.0144	.....	
10	15,000	.0156	.0141	
84	16,000	.0174	.....	
58	17,000	.0191	.....	
32	18,000	.0206	.....	
06	19,000	.0222	.....	
80	20,000	.0235	.0191	
54	21,000	.0267	.....	
28	22,000	.0311	.....	
02	23,000	.0371	.....	
76	24,000	.0449	.....	
50	25,000	.0549	.0517	
24	26,000	.0706	.....	
98	27,000	.0862	.....	
72	28,000	.1043	.....	
46	29,000	.1261	.....	
20	30,000	.15	.....	
94	31,000	.18	.....	
68	32,000	.23	.....	
42	33,000	.28	.....	
00	33,660	.37	.....	Tensile strength.

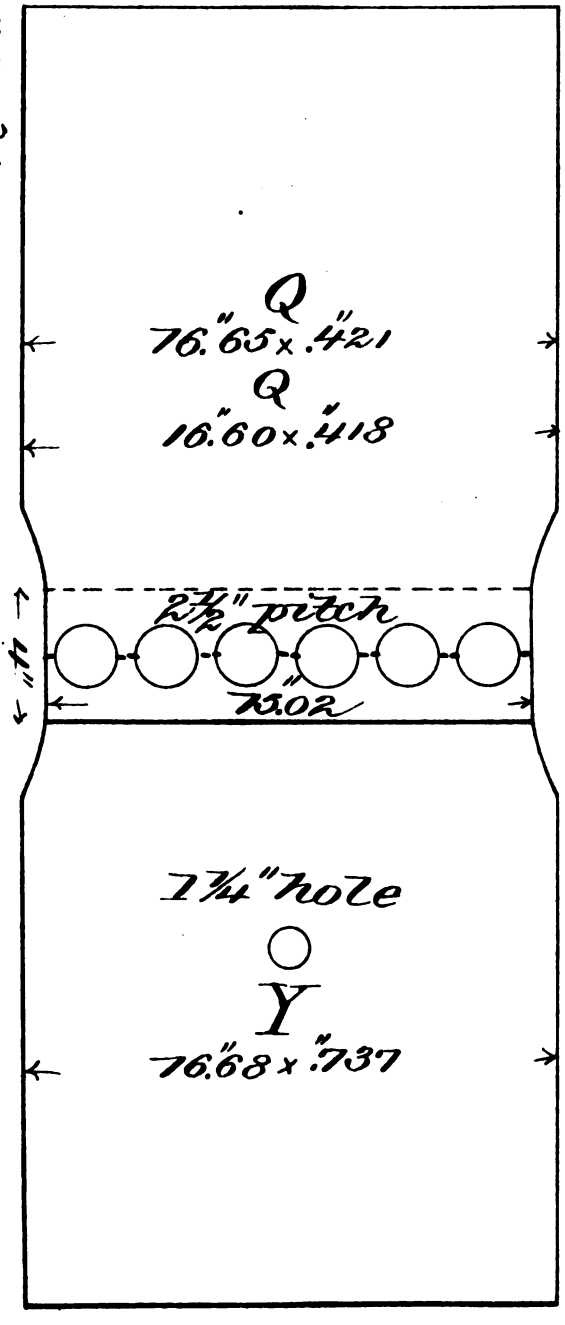
ctured plate along line of riveting.
pearance, silky. Open at edges ″.10 and ″.08.
ngation of rivet-holes, ″.51, ″.50, ″.50, ″.50, ″.50, ″.49.
a at fracture (one section), ″.90×″.47=.4230 square inch.
traction, 48.8 per cent.

Maximum stress on joint.

on gross section of plate	pounds per square inch..	33,660
on net section of plate	do....	71,070
sion on bearing surface of rivets	do....	63,960
g on rivets	do....	23,940

ncy of joint, 55.7 per cent.

H Ex 31 49 2



Areas.

ss sectional area	square inches..	11.070
sectional area	do....	5.542
ring surface of rivets	do....	5.528
earing area	do....	11.726

plied loads.		In gauged length.		Remarks.
.	Per square inch.	Elongation.	Set.	
ls.	*Pounds.*	*Inch.*	*Inch.*	
0	1,000	0.	0.	Initial load.
0	2,000	.0000	.....	
0	3,000	.0001	.....	
0	4,000	.0005	.....	
0	5,000	.0011	.0010	
0	6,000	.0044	.....	
0	7,000	.0055	.....	
0	8,000	.0064	.....	
0	9,000	.0076	.....	
0	10,000	.0101	.0091	
0	11,000	.0133	.....	
0	12,000	.0148	.....	
0	13,000	.0159	.....	
0	14,000	.0170	.....	
0	15,000	.0181	.0160	
0	16,000	.0198	.....	
0	17,000	.0211	.....	
0	18,000	.0241	.....	
0	19,000	.0290	.....	
0	20,000	.0343	.0238	
0	21,000	.0403	.....	
0	22,000	.0445	.....	
0	23,000	.0530	.....	
0	24,000	.0618	.....	
0	25,000	.0732	.0648	
0	26,000	.0890	.....	
0	27,000	.1076	.....	
0	28,000	.1291	.....	
0	29,000	.16	.....	
0	30,000	.18	.....	
0	31,000	.21	.....	
0	32,000	.26	.....	
0	33,000	.30	.....	
0	34,000	.38	.....	
0	34,780	.48	.....	Tensile strength.

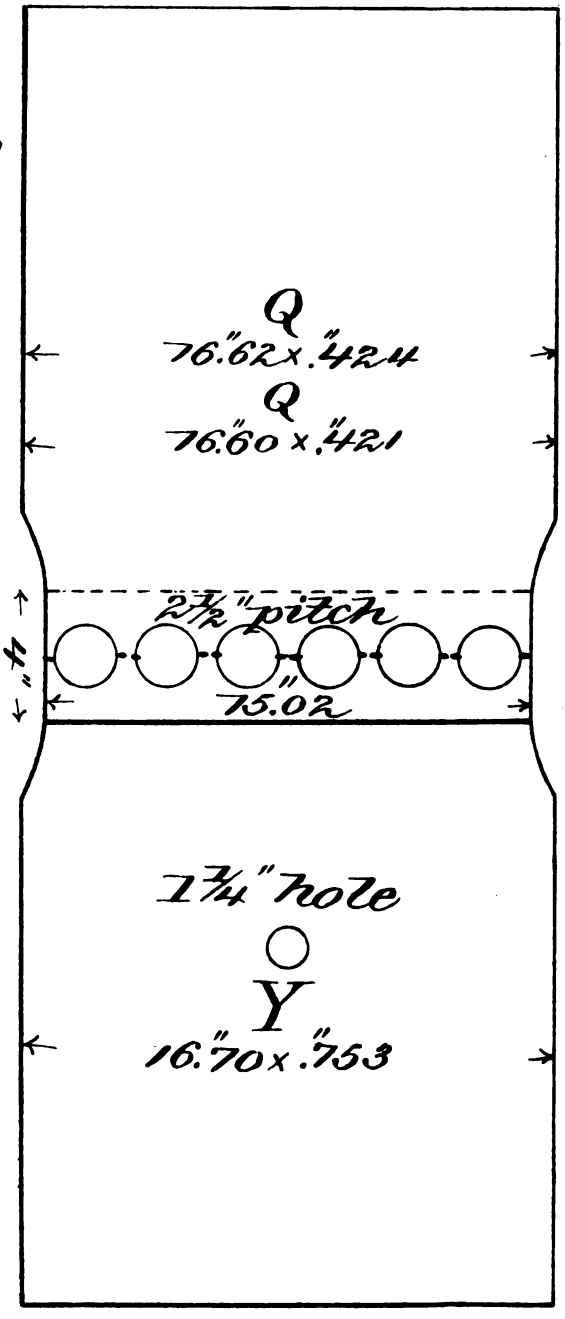
:tured plate along line of riveting.
earance, silky, lamellar. Open at edges ″.08 each.
gation of rivet-holes, ″.53, ″.53, ″.50, ″.47, ″49, ″.52.
at fracture (one section), 1″.06×″.51=.5406 square inch.
:raction, 41.3 per cent.

Maximum stress on joint.

n gross section of plate	pounds per square inch..	34,780
n net section of plate	do....	69,470
ion on bearing surface of rivets	do....	69,650
on rivets	do....	26,140

cy of joint, 57.5 per cent.

H Ex 31 49 2



Areas.

Plate, gross sectional area	square inches	11.310
Plate, net sectional area	do	5.662
Plate, bearing surface of rivets	do	5.648
Rivets, shearing area	do	14.726

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
11,310	1,000	0.	0.	Initial load.
22,620	2,000	.0003	.....	
33,930	3,000	.0005	.....	
45,240	4,000	.0008	.....	
56,550	5,000	.0012	.0008	
67,860	6,000	.0018	.....	
79,170	7,000	.0028	.....	
90,480	8,000	.0065	.....	
101,790	9,000	.0079	.....	
113,100	10,000	.0090	.0085	
124,410	11,000	.0105	.....	
135,720	12,000	.0123	.....	
147,030	13,000	.0135	.....	
158,340	14,000	.0167	.....	
169,650	15,000	.0183	.0165	
180,960	16,000	.0205	.....	
192,270	17,000	.0221	.....	
203,580	18,000	.0233	.....	
214,890	19,000	.0250	.....	
226,200	20,000	.0290	.0245	
237,510	21,000	.0345	.....	
248,820	22,000	.0430	.....	
260,130	23,000	.0550	.....	
271,440	24,000	.0630	.....	
282,750	25,000	.0720	.....	
294,060	26,000	.0825	.0752	
305,370	27,000	.1039	.....	
316,680	28,000	.1250	.....	
327,990	29,000	.15	.....	
339,300	30,000	.17	.....	
350,610	31,000	.21	.....	
361,920	32,000	.26	.....	
373,230	33,000	.30	.....	
384,540	34,000	.37	.....	
392,100	34,670	.48	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar, except one end section, which was granular in part, radiating from silky metal next rivet-hole. Open at edges ″.12 and ″.10.

Area at fracture (one section), 1″.04×″.51=.5304 square inch.

Contraction, 43.6 per cent.

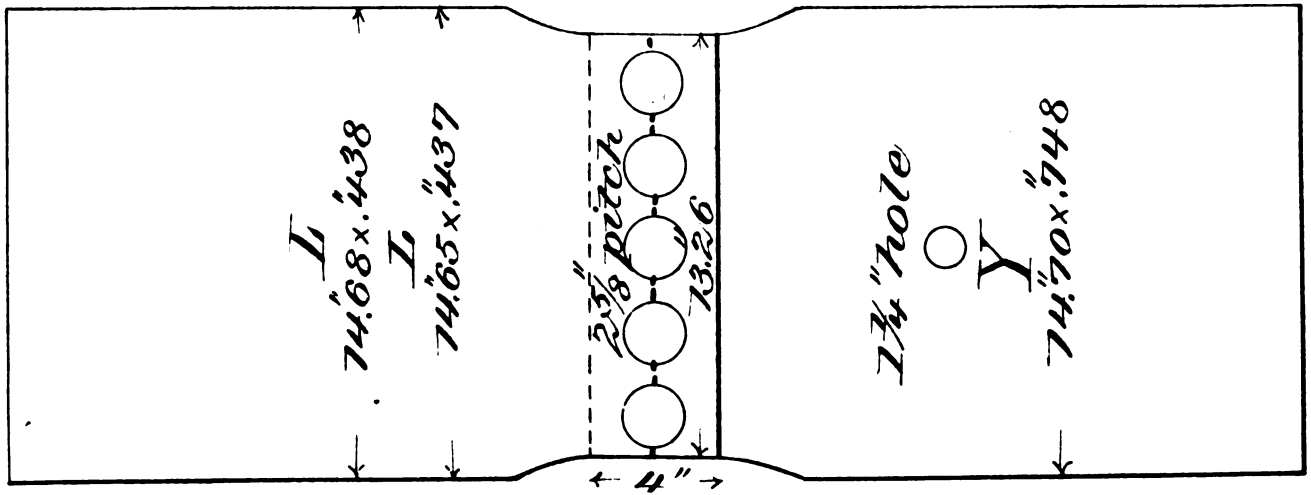
Elongation of rivet-holes, ″.58, ″.55, ″.52, ″.52, ″.53, ″.56.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,670
Tension on net section of plate	do	60,250
Compression on bearing surface of rivets	do	69,420
Shearing on rivets	do	26,620

Efficiency of joint, 57.4 per cent.

No. 1510 3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.918
Plate, net sectional area	do....	5.243
Plate, bearing surface of rivets	do....	4.675
Rivets, shearing area	do....	12.272

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,918	1,000	0.	0.	Initial load.
19,836	2,000	.0001	.....	
29,754	3,000	.0003	.....	
39,672	4,000	.0006	.....	
49,590	5,000	.0009	.0002	
59,508	6,000	.0017	.....	
69,426	7,000	.0028	.....	
79,344	8,000	.0042	.....	
89,262	9,000	.0062	.....	
99,180	10,000	.0088	.0056	
109,098	11,000	.0109	.....	
119,016	12,000	.0127	.....	
128,934	13,000	.0144	.....	
138,852	14,000	.0169	.....	
148,770	15,000	.0189	.0139	
158,688	16,000	.0213	.....	
168,606	17,000	.0230	.....	
178,524	18,000	.0253	.....	
188,442	19,000	.0285	.....	
198,360	20,000	.0323	.0242	
208,278	21,000	.0377	.....	
218,196	22,000	.0426	.....	
228,114	23,000	.0510	.....	
238,032	24,000	.0655	.....	
247,950	25,000	.0803	.0690	
257,868	26,000	.0976	.....	
267,786	27,000	.1142	.....	
277,704	28,000	.14	.....	
287,622	29,000	.16	.....	
297,540	30,000	.18	.....	
307,458	31,000	.20	.....	
317,376	32,000	.25	.....	
327,294	33,000	.27	.....	
337,212	34,000	.33	.....	
347,130	35,000	.39	.....	
357,048	36,000	.51	.....	
358,500	36,120	.58	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at one edge ″.05.
Elongation of rivet-holes, ″.61, ″.61, ″.63, ″.63, ″.61.
Area at fracture (one section), 1″.17 × ″.50 = .585 square inch.
Contraction, 43.1 per cent.

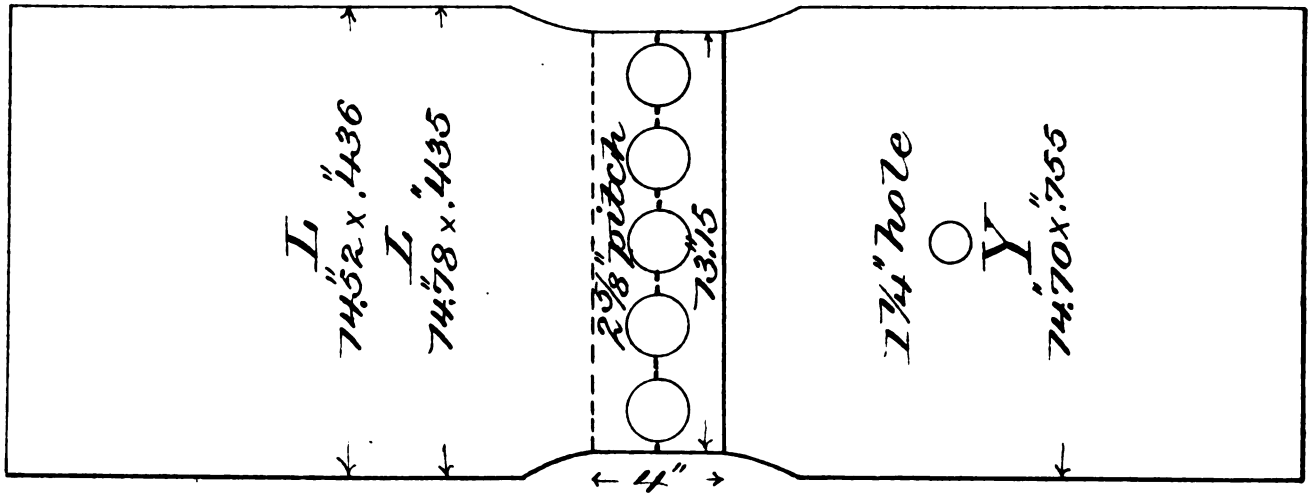
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch....	36,120
Tension on net section of plate	do....	68,380
Compression on bearing surface of rivets	do....	76,680
Shearing on rivets	do....	29,210

Efficiency of joint, 59.7 per cent.

No. 7511

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.928
Plate, net sectional area	do....	5.209
Plate, bearing surface of rivets	do....	4.719
Rivets, shearing area	do....	12.272

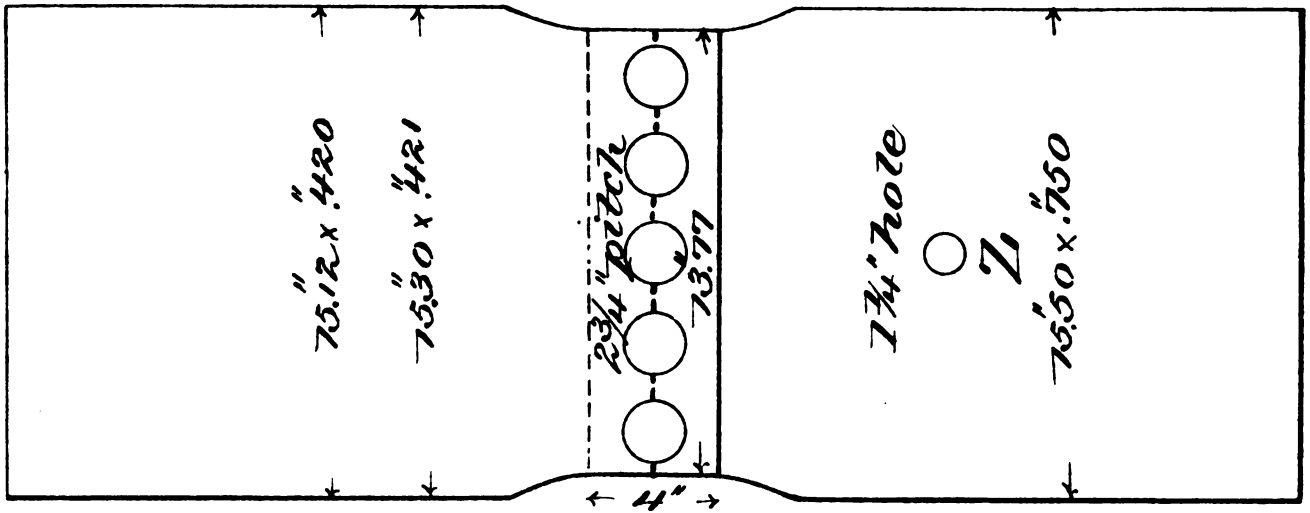
Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,928	1,000	0.	0.	Initial load.
19,856	2,000	.0004	.....	
29,784	3,000	.0008	.....	
39,712	4,000	.0010	.....	
49,640	5,000	.0015	.0009	
59,568	6,000	.0030	.....	
69,496	7,000	.0090	.....	
79,424	8,000	.0110	.....	
89,352	9,000	.0127	.....	
99,280	10,000	.0139	.0116	
109,208	11,000	.0148	.....	
119,136	12,000	.0161	.....	
129,064	13,000	.0177	.....	
138,992	14,000	.0198	.....	
148,920	15,000	.0220	.0190	
158,848	16,000	.0235	.....	
168,776	17,000	.0250	.....	
178,704	18,000	.0265	.....	
188,632	19,000	.0278	.....	
198,560	20,000	.0299	.0235	
208,488	21,000	.0330	.....	
218,416	22,000	.0370	.....	
228,344	23,000	.0451	.....	
238,272	24,000	.0605	.....	
248,200	25,000	.0787	.0685	
258,128	26,000	.0964	.....	
268,056	27,000	.1110	.....	
277,984	28,000	.14	.....	
287,912	29,000	.15	.....	
297,840	30,000	.18	.....	
307,768	31,000	.21	.....	
317,696	32,000	.25	.....	
327,624	33,000	.28	.....	
337,552	34,000	.32	.....	
347,480	35,000	.37	.....	
357,408	36,000	.46	.....	
366,700	36,940	.58	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.12 and ″.05.
Elongation of rivet-holes, ″.57, ″.57, ″.57, ″.58, ″.57.
Area at fracture (one section), 1″.16×″.52=.6032 square inch.
Contraction, 41.8 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,940
Tension on net section of plate	do....	70,400
Compression on bearing surface of rivets	do....	77,710
Shearing on rivets	do....	29,880

Efficiency of joint, 61.1 per cent.



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.328
Plate, net sectional area	do....	5.640
Plate, bearing surface of rivets	do....	4.688
Rivets, shearing area	do....	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,328	1,000	0.	0.	Initial load.
20,656	2,000	.0002	.....	
30,984	3,000	.0005	.....	
41,312	4,000	.0008	.....	
51,640	5,000	.0017	.0014	
61,968	6,000	.0057	.....	
72,296	7,000	.0080	.....	
82,624	8,000	.0106	.....	
92,952	9,000	.0122	.....	
103,280	10,000	.0136	.0115	
113,608	11,000	.0147	.....	
123,936	12,000	.0167	.....	
134,264	13,000	.0187	.....	
144,592	14,000	.0208	.....	
154,920	15,000	.0227	.0188	
165,248	16,000	.0262	.....	
175,576	17,000	.0291	.....	
185,904	18,000	.0334	.....	
196,232	19,000	.0373	.....	
206,560	20,000	.0461	.0392	
216,888	21,000	.0567	.....	
227,216	22,000	.0672	.....	
237,544	23,000	.0786	.....	
247,872	24,000	.0905	.....	
258,200	25,000	.1086	.0988	
268,528	26,000	.14	.....	
278,856	27,000	.16	.....	
289,184	28,000	.19	.....	
299,512	29,000	.22	.....	
309,840	30,000	.26	.....	
320,168	31,000	.31	.....	
330,496	32,000	.37	.....	
340,824	33,000	.45	.....	
348,400	33,730	.58	.....	Tensile strength.

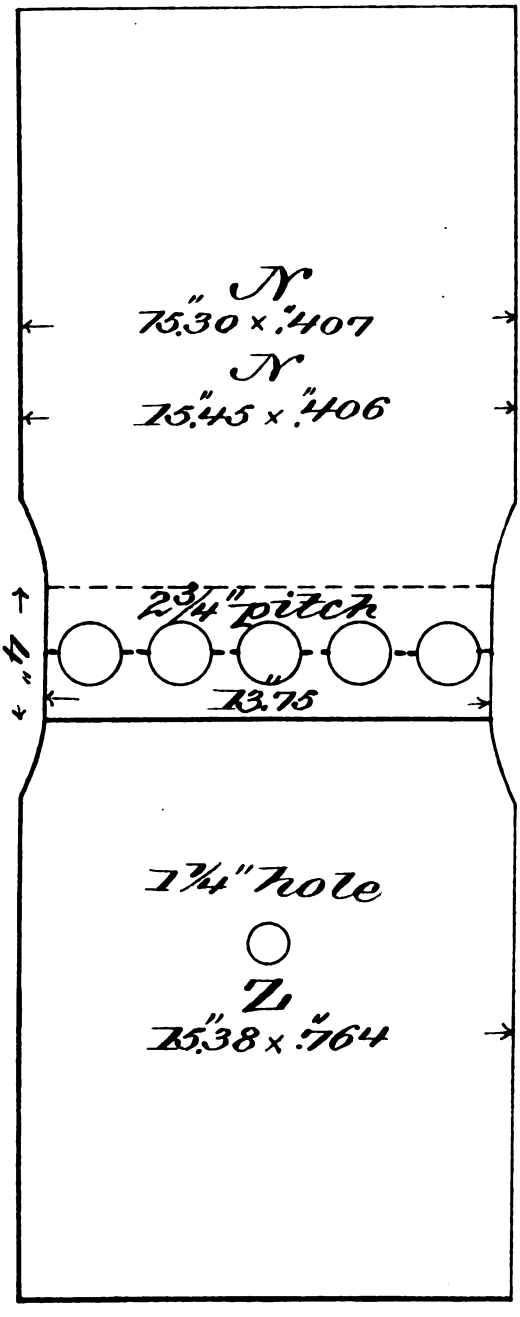
Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.15 and ″.10.
Elongation of rivet-holes, ″.73, ″.71, ″.71, ″.71, ″.78.
Area at fracture (one section), 1″.22×″.44=.5366 square inch.
Contraction, 52.3 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,730
Tension on net section of plate	do....	61,770
Compression on bearing surface of rivets	do....	74,320
Shearing on rivets	do....	28,390

Efficiency of joint, 57.0 per cent.

H Ex 31 49 2



Areas.

Plate, gross sectional area	square inches	10.505
Plate, net sectional area	do	5.730
Plate, bearing surface of rivets	do	4.775
Rivets, shearing area	do	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,505	1,000	0.	0.	Initial load.
21,010	2,000	.0004	.....	
31,515	3,000	.0008	.....	
42,020	4,000	.0011	.....	
52,525	5,000	.0015	.0009	
63,030	6,000	.0073	.....	
73,535	7,000	.0093	.....	
84,040	8,000	.0101	.....	
94,545	9,000	.0145	.....	
105,050	10,000	.0165	.0158	
115,555	11,000	.0193	.....	
126,060	12,000	.0213	.....	
136,565	13,000	.0228	.....	
147,070	14,000	.0243	.....	
157,575	15,000	.0258	.0241	
168,080	16,000	.0297	.....	
178,585	17,000	.0338	.....	
189,090	18,000	.0360	.....	
199,595	19,000	.0395	.....	
210,100	20,000	.0464	.0383	
220,605	21,000	.0545	.....	
231,110	22,000	.0637	.....	
241,615	23,000	.0762	.....	
252,120	24,000	.0899	.....	
262,625	25,000	.1051	.0938	
273,130	26,000	.11	.....	
283,635	27,000	.14	.....	
294,140	28,000	.16	.....	
304,645	29,000	.19	.....	
315,150	30,000	.23	.....	
325,655	31,000	.27	.....	
336,160	32,000	.31	.....	
346,665	33,000	.37	.....	
357,170	34,000	.44	.....	
367,675	35,000	.55	.....	
370,400	35,260	.61	.....	Tensile strength.

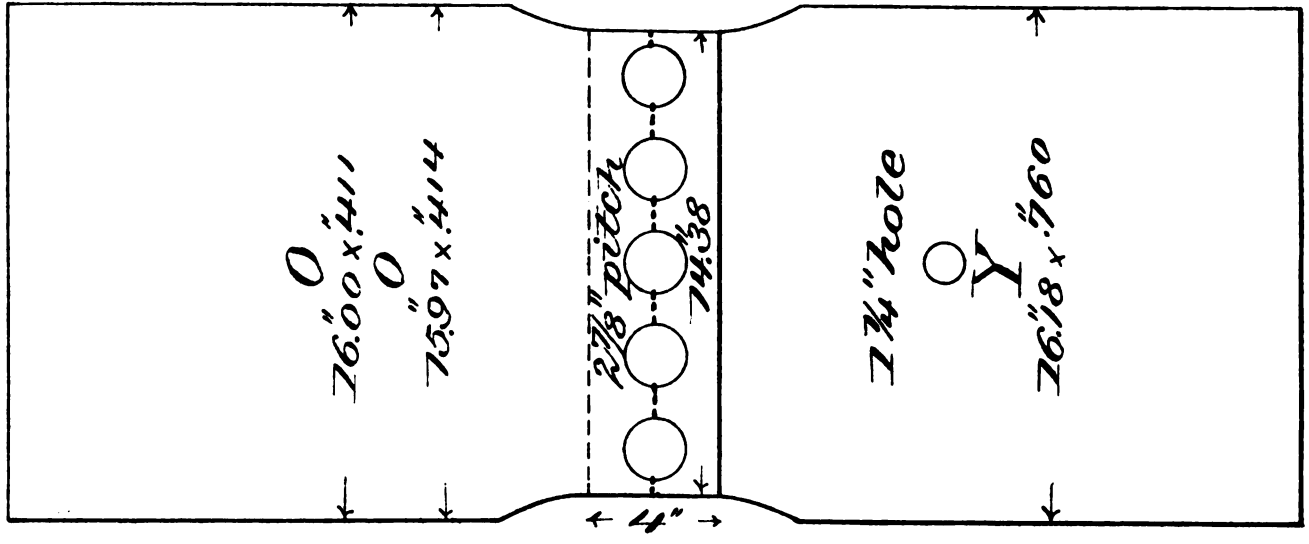
Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.30 and ″.20.
Elongation of rivet-holes, ″.71, ″.68, ″.64, ″.65, ″.67.
Area at fracture (one section), 1″.26×″.51=.6426 square inch.
Contraction, 43.9 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	35,260
Tension on net section of plate	do	64,640
Compression on bearing surface of rivets	do	77,570
Shearing on rivets	do	30,100

Efficiency of joint, 59.7 per cent.

No. 1514 — 3/4" steel plate



H Ex 31 49 2

Areas.

·oss sectional area	square inches..	10.929
·t sectional area	do....	6.179
·aring surface of rivets	do....	4.750
·hearing area	do....	12.272

pplied loads.		In gauged length.		Remarks.
al.	Per square inch.	Elongation.	Set.	
·ds.	*Pounds.*	*Inch.*	*Inch.*	
20	1,000	0.	0.	Initial load.
58	2,000	.0002	.....	
87	3,000	.0002	.....	
16	4,000	.0001	.....	
45	5,000	.0046	.0051	
74	6,000	.0078	.....	
03	7,000	.0098	.....	
32	8,000	.0110	.....	
61	9,000	.0126	.....	
90	10,000	.0133	.0131	
19	11,000	.0150	.....	
48	12,000	.0159	.....	
77	13,000	.0182	.....	
06	14,000	.0194	.....	
35	15,000	.0209	.0198	
64	16,000	.0222	.....	
93	17,000	.0242	.....	
22	18,000	.0263	.....	
51	19,000	.0283	.....	
80	20,000	.0308	.0261	
09	21,000	.0382	.....	
38	22,000	.0493	.....	
67	23,000	.0618	.....	
96	24,000	.0750	.....	
25	25,000	.0890	.0817	
54	26,000	.1058	.....	
83	27,000	.1225	.....	
12	28,000	.16	.....	
41	29,000	.19	.....	
70	30,000	.21	.....	
99	31,000	.26	.....	
28	32,000	.29	.....	
57	33,900	.35	.....	
86	34,000	.39	.....	
15	35,000	.46	.....	
44	36,000	.54	.....	
73	37,000	.63	.....	
00	37,930	.86	.....	Tensile strength.

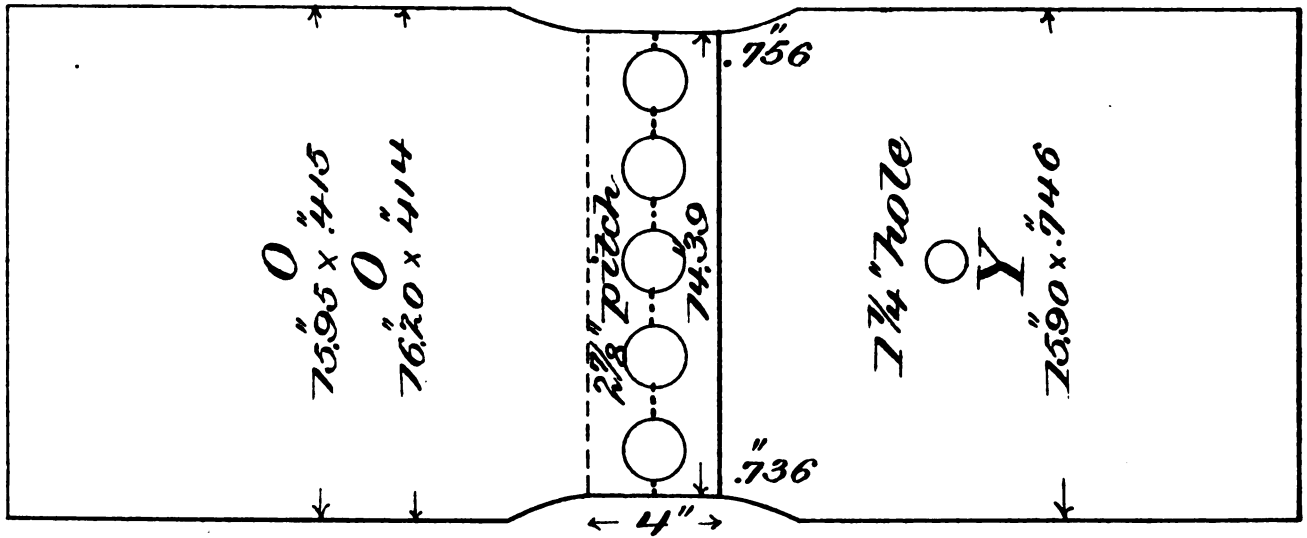
·tured plate along line of riveting.
·earance, silky, slightly lamellar. Open at edges ″.15 and ″.12.
a at fracture (one section), 1″.39×″.52=.7228 square inch.
traction, 41.4 per cent.
ıgation of rivet-holes, ″.70, ″.72, ″75, ″.85, ″.85.

Maximum stress on joint.

on gross section of plate	pounds per square inch..	37,930
on net section of plate	do....	67,080
ion on bearing surface of rivets	do....	87,200
on rivets	do....	36,220

ıcy of joint, 62.7 per cent.

Steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	10.735
Plate, net sectional area	do	6.072
Plate, bearing surface of rivets	do	4.663
Rivets, shearing area	do	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,735	1,000	0.	0.	Initial load.
21,470	2,000	—.0001	.....	
32,205	3,000	—.0001	.....	
42,940	4,000	.0000	.....	
53,675	5,000	.0003	.0001	
64,410	6,000	.0021	.....	
75,145	7,000	.0036	.....	
85,880	8,000	.0080	.....	
96,615	9,000	.0106	.....	
107,350	10,000	.0120	.0113	
118,085	11,000	.0136	.....	
128,820	12,000	.0144	.....	
139,555	13,000	.0156	.....	
150,200	14,000	.0166	.....	
161,025	15,000	.0183	.0153	
171,760	16,000	.0206	.....	
182,495	17,000	.0221	.....	
193,230	18,000	.0251	.....	
203,965	19,000	.0264	.....	
214,700	20,000	.0272	.0226	
225,435	21,000	.0308	.....	
236,170	22,000	.0341	.....	
246,905	23,000	.0412	.....	
257,640	24,000	.0556	.....	
268,375	25,000	.0736	.0648	
279,110	26,000	.0806	.....	
289,845	27,000	.1044	.....	
300,580	28,000	.14	.....	
311,315	29,000	.16	.....	
322,050	30,000	.18	.....	
332,785	31,000	.24	.....	
343,520	32,000	.26	.....	
354,255	33,000	.20	.....	
364,990	34,000	.34	.....	
375,725	35,000	.39	.....	
386,460	36,000	.46	.....	
397,195	37,000	.56	.....	
403,600	37,600	.62	.....	
415,700	38,720	.85	.....	Tensile strength.

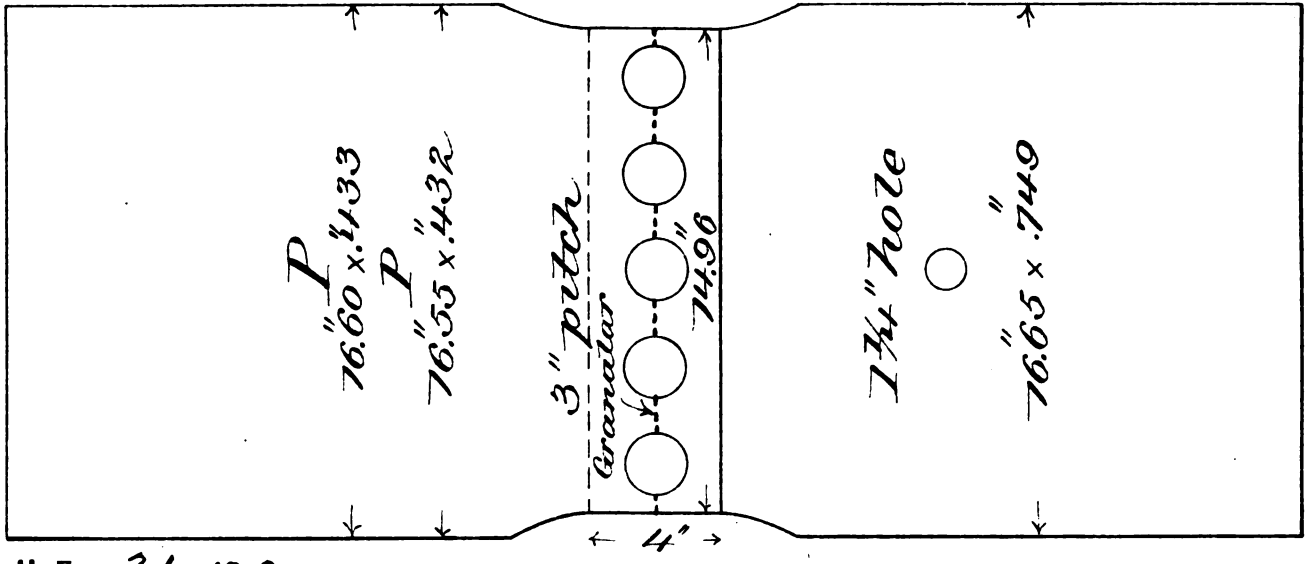
Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.25 and ″.10.
Elongation of rivet-holes, ″.80, ″.78, ″.75, ″.75, ″.73.
Area at fracture (one section), 1″.42 × ″.51 = .7242 square inch.
Contraction, 40.2 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,720
Tension on net section of plate	do	68,460
Compression on bearing surface of rivets	do	89,150
Shearing on rivets	do	32,870

Efficiency of joint, 64.0 per cent.

74 steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	11.205
Plate, net sectional area	do	6.524
Plate, bearing surface of rivets	do	4.681
Rivets, shearing area	do	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
11,205	1,000	0.	0.	Initial load.
22,410	2,000	.0000	.....	
33,615	3,000	.0001	.....	
44,820	4,000	.0005	.....	
56,025	5,000	.0018	.0010	
67,230	6,000	.0027	.....	
78,435	7,000	.0042	.....	
89,640	8,000	.0077	.....	
100,845	9,000	.0107	.....	
112,050	10,000	.0137	.0113	
123,255	11,000	.0167	.....	
134,460	12,000	.0182	.....	
145,665	13,000	.0194	.....	
156,870	14,000	.0208	.....	
168,075	15,000	.0227	.0177	
179,280	16,000	.0244	.....	
190,485	17,000	.0266	.....	
201,690	18,000	.0288	.....	
212,895	19,000	.0315	.....	
224,100	20,000	.0357	.0277	
235,305	21,000	.0388	.....	
246,510	22,000	.0544	.....	
257,715	23,000	.0685	.....	
268,920	24,000	.0895	.....	
280,125	25,000	.0977	.0851	
291,330	26,000	.1163	.....	
302,535	27,000	.1350	.....	
313,740	28,000	.16	.....	
324,945	29,000	.19	.....	
336,150	30,000	.22	.....	
347,355	31,000	.27	.....	
358,560	32,000	.31	.....	
369,765	33,000	.37	.....	
380,970	34,000	.42	.....	
392,175	35,000	.45	.....	
403,380	36,000	.62	.....	
409,300	36,530	.78	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, five fractured sections silky, one section granular.

A sharp report preceded the final fracture of the plate, attributed to the rupture of the granular section.

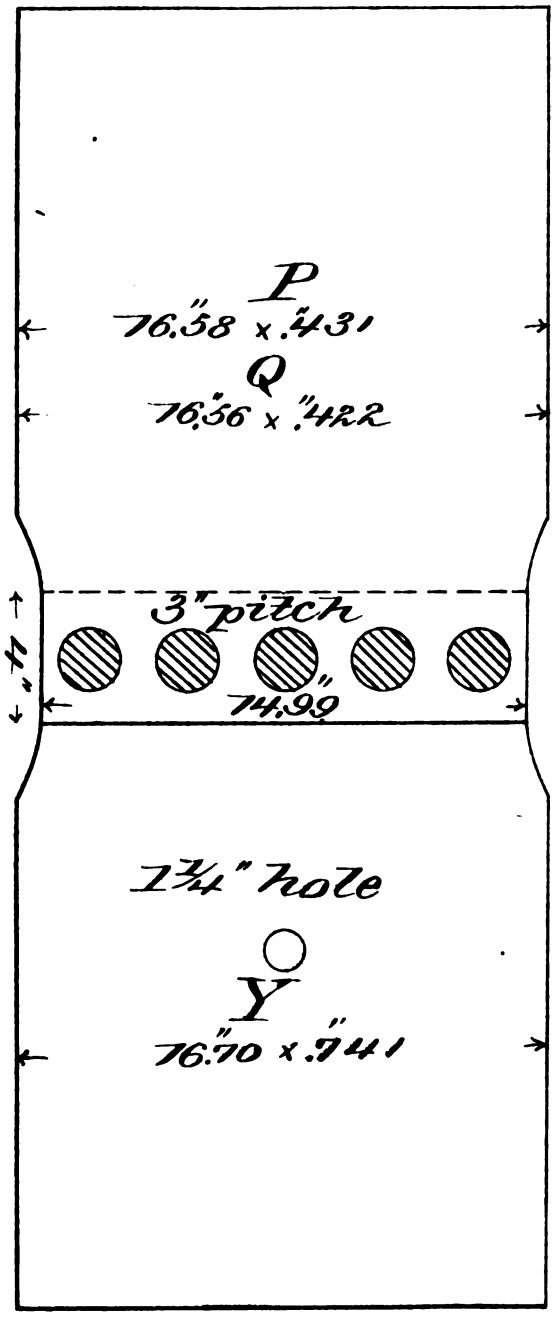
Area at fracture: One silky section, 1″.52×″.48=.7296 square inch; contraction, 44.3 per cent. One granular section, 1″.62×″.57=.9234 square inch; contraction, 29.5 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,530
Tension on net section of plate	do	62,740
Compression on bearing surface of rivets	do	87,440
Shearing on rivets	do	36,610

Efficiency of joint, 65.8 per cent.

H Ex 31 492



Areas.

ross sectional area	square inches	11.108
et sectional area	do	6.477
earing surface of rivets	do	4.631
shearing area	do	12.272

pplied loads.		In gauged length.		Remarks.
tal.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inch.*	*Inch.*	
108	1,000	0.	0.	Initial load.
216	2,000	0.	.....	
324	3,000	.0002	.....	
432	4,000	.0013	.....	
540	5,000	.0020	.0020	
648	6,000	.0030	.....	
756	7,000	.0086	.....	
864	8,000	.0109	.....	
972	9,000	.0132	.....	
080	10,000	.0152	.0148	
188	11,000	.0184	.....	
296	12,000	.0200	.....	
404	13,000	.0215	.....	
512	14,000	.0238	.....	
620	15,000	.0252	.0221	
728	16,000	.0269	.....	
836	17,000	.0288	.....	
944	18,000	.0303	.....	
052	19,000	.0320	.....	
160	20,000	.0340	.0296	
268	21,000	.0430	.....	
376	22,000	.0532	.....	
484	23,000	.0610	.....	
592	24,000	.0721	.....	
700	25,000	.0867	.0797	
808	26,000	.1050	.....	
916	27,000	.1208	.....	
024	28,000	.16	.....	
132	29,000	.17	.....	
240	30,000	.20	.....	
348	31,000	.24	.....	
456	32,000	.28	.....	
564	33,000	.32	.....	
672	34,000	.38	.....	
780	35,000	.44	.....	
888	36,000	.49	.....	
996	37,000	.57	.....	
104	38,000	.68	.....	
300	38,740	.76	.....	Tensile strength.

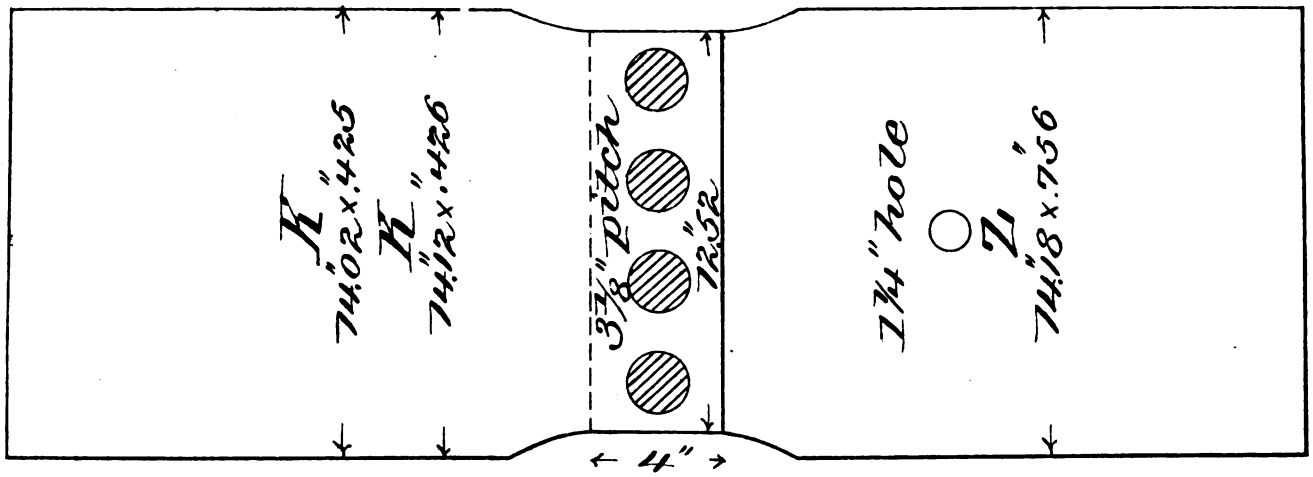
eared the rivets.
ngation of rivet-holes, ″.37 each.

Maximum stress on joint.

on gross section of plate	pounds per square inch	38,740
on net section of plate	do	66,440
ssion on bearing surface of rivets	do	92,920
g on rivets	do	35,060

ency of joint, 64.1 per cent.

74 steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.465
Plate, net sectional area	do	5.685
Plate, bearing surface of rivets	do	3.780
Rivets, shearing area	do	9.818

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,465	1,000	0.	0.	Initial load.
18,930	2,000	.0007	.....	
28,395	3,000	.0035	.....	
37,860	4,000	.0062	.....	
47,325	5,000	.0083	.0072	
56,790	6,000	.0144	.....	
66,255	7,000	.0169	.....	
75,720	8,000	.0182	.....	
85,185	9,000	.0196	.....	
94,650	10,000	.0207	.0166	
104,115	11,000	.0223	.....	
113,580	12,000	.0238	.....	
123,045	13,000	.0251	.....	
132,510	14,000	.0265	.....	
141,975	15,000	.0281	.0216	
151,440	16,000	.0299	.....	
160,905	17,000	.0315	.....	
170,370	18,000	.0334	.....	
179,835	19,000	.0359	.....	
189,300	20,000	.0411	.0314	
198,765	21,000	.0486	.....	
208,230	22,000	.0600	.....	
217,695	23,000	.0785	.....	
227,160	24,000	.0984	.....	
236,625	25,000	.1180	.....	
246,090	26,000	.15	.....	
255,555	27,000	.17	.....	
265,020	28,000	.19	.....	
274,485	29,000	.22	.....	
283,950	30,000	.28	.....	
293,415	31,000	.32	.....	
302,880	32,000	.38	.....	
312,345	33,000	.43	.....	
321,810	34,000	.50	.....	
331,275	35,000	.59	.....	
340,740	36,000	.68	.....	
350,205	37,000	.80	.....	
354,500	37,560	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".49, ".47, ".47, ".47.

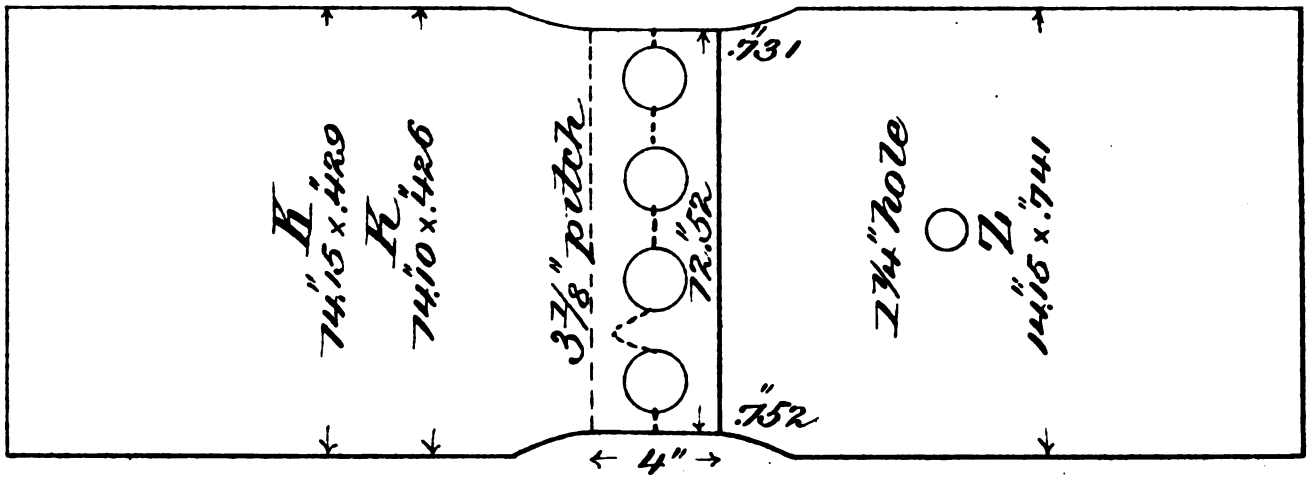
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	37,560
Tension on net section of plate	do	62,360
Compression on bearing surface of rivets	do	93,780
Shearing on rivets	do	36,110

Efficiency of joint, 63.6 per cent.

No. 7579

3/4" Steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.277
Plate, net sectional area	do	5.572
Plate, bearing surface of rivets	do	3.705
Rivets, shearing area	do	9.818

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,277	1,000	0.	0.	Initial load.
18,554	2,000	.0005	.....	
27,831	3,000	.0007	.....	
37,108	4,000	.0010	.....	
46,385	5,000	.0013	.0008	
55,662	6,000	.0021	.....	
64,939	7,000	.0043	.....	
74,216	8,000	.0051	.....	
83,493	9,000	.0059	.....	
92,770	10,000	.0084	.0068	
102,047	11,000	.0093	.....	
111,324	12,000	.0110	.....	
120,601	13,000	.0122	.....	
129,878	14,000	.0135	.....	
139,155	15,000	.0151	.0124	
148,432	16,000	.0171	.....	
157,709	17,000	.0181	.....	
166,986	18,000	.0195	.....	
176,263	19,000	.0209	.....	
185,540	20,000	.0220	.0171	
194,817	21,000	.0231	.....	
204,094	22,000	.0251	.....	
213,371	23,000	.0281	.....	
222,648	24,000	.0321	.....	
231,925	25,000	.0375	.0317	
241,202	26,000	.0531	.....	
250,479	27,000	.0654	.....	
259,756	28,000	.0814	.....	
269,033	29,000	.0961	.....	
278,310	30,000	.1116	.....	
287,587	31,000	.1323	.....	
296,864	32,000	.15	.....	
306,141	33,000	.17	.....	
315,418	34,000	.21	.....	
324,695	35,000	.25	.....	
333,972	36,000	.30	.....	
343,249	37,000	.36	.....	
352,526	38,000	.45	.....	
361,803	39,000	.60	.....	Tensile strength.

Fractured plate along line of riveting.
Near approach to tearing out plate in front of rivet at one section.
Appearance, silky, slightly lamellar.
Area at fracture (one section), 1″.64×″.48=.7872 square inch.
Contraction, 43.3 per cent.
Elongation of rivet-holes, ″.75, ″.82, ″.82, ″.68.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	39,000
Tension on net section of plate	do	64,930
Compression on bearing surface of rivets	do	97,650
Shearing on rivets	do	36,850

Efficiency of joint, 66.1 per cent.

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.934
Plate, net sectional area	do	6.119
Plate, bearing surface of rivets	do	3.815
Rivets, shearing area	do	9.818

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,934	1,000	0.	0.	Initial load.
19,868	2,000	.0000	.....	
29,802	3,000	.0004	.....	
39,736	4,000	.0007	.....	
49,670	5,000	.0016	.0013	
59,604	6,000	.0027	.....	
69,538	7,000	.0036	.....	
79,472	8,000	.0046	.....	
89,406	9,000	.0074	.....	
99,340	10,000	.0104	.0085	
109,274	11,000	.0127	.....	
119,208	12,000	.0140	.....	
129,142	13,000	.0146	.....	
139,076	14,000	.0155	.....	
149,010	15,000	.0165	.0129	
158,944	16,000	.0182	.....	
168,878	17,000	.0200	.....	
178,812	18,000	.0226	.....	
188,746	19,000	.0270	.....	
198,680	20,000	.0309	.0255	
208,614	21,000	.0354	.....	
218,548	22,000	.0435	.....	
228,482	23,000	.0550	.....	
238,416	24,000	.0695	.....	
248,350	25,000	.0828	.0749	
258,284	26,000	.0995	.....	
268,218	27,000	.1165	.....	
278,152	28,000	.1350	.....	
288,086	29,000	.16	.....	
298,020	30,000	.18	.....	
307,954	31,000	.22	.....	
317,888	32,000	.24	.....	
327,822	33,000	.29	.....	
337,756	34,000	.34	.....	
347,690	35,000	.41	.....	
357,624	36,000	.50	.....	
367,558	37,000	.65	.....	
373,500	37,600	.84	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky.
Area at fracture (one section), 1″.71×″.49=.8379 square inch.
Contraction, 45.4 per cent.
Elongation of rivet-holes, 1″.22, 1″.05, ″.98, ″.83.

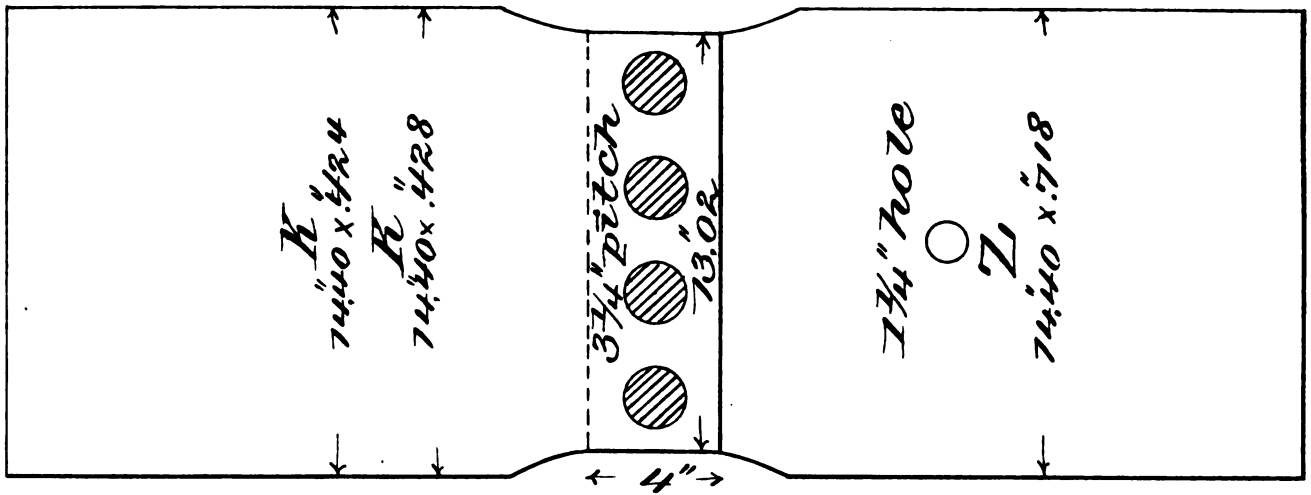
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	37,600
Tension on net section of plate	do	61,040
Compression on bearing surface of rivets	do	97,900
Shearing on rivets	do	38,040

Efficiency of joint, 63.7 per cent.

No. 1521

3/4" steel plate



H Ex 31 49 2

Areas.

ate, gross sectional area	square inches	9.348
ate, net sectional area	do	5.758
ate, bearing surface of rivets	do	3.590
vets, shearing area	do	9.818

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,348	1,000	0.	0.	Initial load.
18,696	2,000	.0005	.....	
28,044	3,000	.0020	.....	
37,392	4,000	.0039	.....	
46,740	5,000	.0097	.0095	
56,088	6,000	.0123	.....	
65,436	7,000	.0137	.....	
74,784	8,000	.0156	.....	
84,132	9,000	.0167	.....	
93,480	10,000	.0180	.0159	
102,828	11,000	.0212	.....	
112,176	12,000	.0234	.....	
121,524	13,000	.0252	.....	
130,872	14,000	.0272	.....	
140,220	15,000	.0289	.0232	
149,568	16,000	.0314	.....	
158,916	17,000	.0338	.....	
168,264	18,000	.0361	.....	
177,612	19,000	.0392	.....	
186,960	20,000	.0439	.0355	
196,308	21,000	.0542	.....	
205,656	22,000	.0662	.....	
215,004	23,000	.0862	.....	
224,352	24,000	.1069	.....	
233,700	25,000	.1266	.1154	
243,048	26,000	.15	.....	
252,396	27,000	.18	.....	
261,744	28,000	.20	.....	
271,092	29,000	.24	.....	
280,440	30,000	.27	.....	
289,788	31,000	.33	.....	
299,136	32,000	.37	.....	
308,484	33,000	.45	.....	
317,832	34,000	.53	.....	
327,180	35,000	.61	.....	
336,528	36,000	.74	.....	Tensile strength.

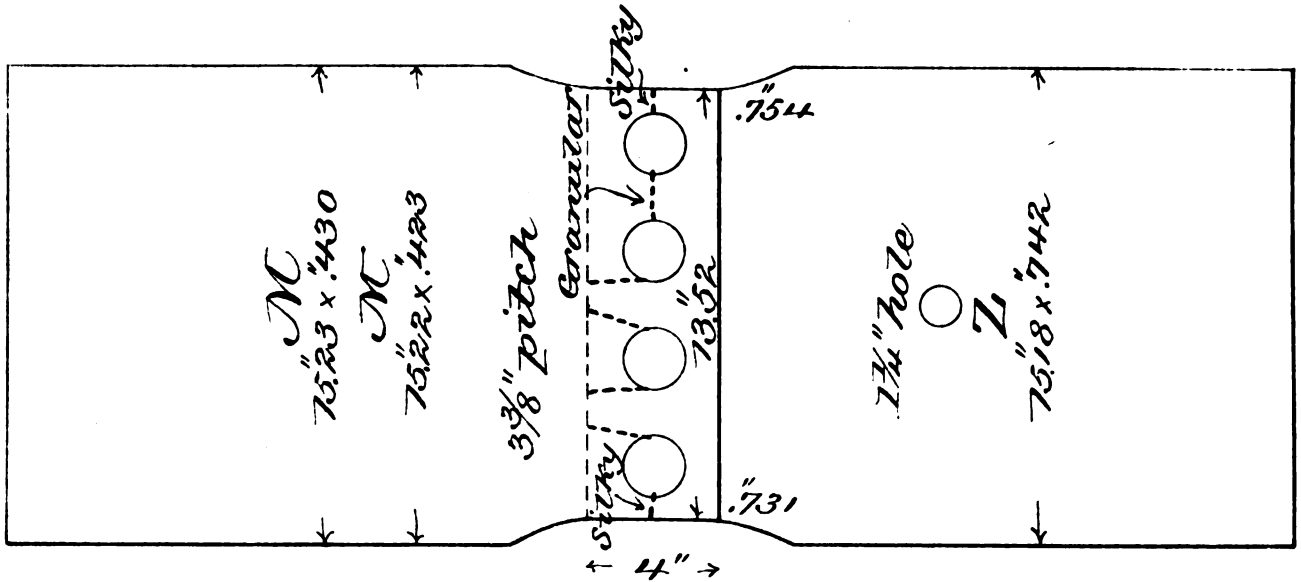
Sheared the rivets.
Elongation of rivet-holes, ″.45, ″.50, ″.64, ″.68.

Maximum stress on joint.

ension on gross section of plate	pounds per square inch	36,000
ension on net section of plate	do	58,440
mpression on bearing surface of rivets	do	93,740
hearing on rivets	do	34,280

Efficiency of joint, 61.0 per cent.

Plate



H Ex 31 49 2

Areas.

sectional area	square inches	10.032
ctional area	do	6.322
ıg surface of rivets	do	3.710
ring area	do	9.818

[Steel rivets.]

ed loads.	In gauged length.		Remarks.
Per square inch.	Elongation.	Set.	
Pounds.	*Inch.*	*Inch.*	
1,000	0.	0.	Initial load.
2,000	.0005	.....	
3,000	.0008	.....	
4,000	.0013	.....	
5,000	.0017	.0011	
6,000	.0029	.....	
7,000	.0056	.....	
8,000	.0066	.....	
9,000	.0077	.....	
10,000	.0088	.0074	
11,000	.0100	.....	
12,000	.0113	.....	
13,000	.0119	.....	
14,000	.0132	.....	
15,000	.0143	.0106	
16,000	.0163	.....	
17,000	.0186	.....	
18,000	.0206	.....	
19,000	.0228	.....	
20,000	.0256	.0196	
21,000	.0304	.....	
22,000	.0351	.....	
23,000	.0426	.....	
24,000	.0550	.....	
25,000	.0676	.0596	
26,000	.0804	.....	
27,000	.0976	.....	
28,000	.1111	.....	
29,000	.13	.....	
30,000	.16	.....	
31,000	.19	.....	
32,000	.21	.....	
33,000	.25	.....	
34,000	.28	.....	
35,000	.31	.....	
36,000	.38	.....	
37,000	.47	.....	
38,000	.53	.....	
39,000	.68	.....	
40,000	.85	.....	
40,040	.....	.....	Tensile strength

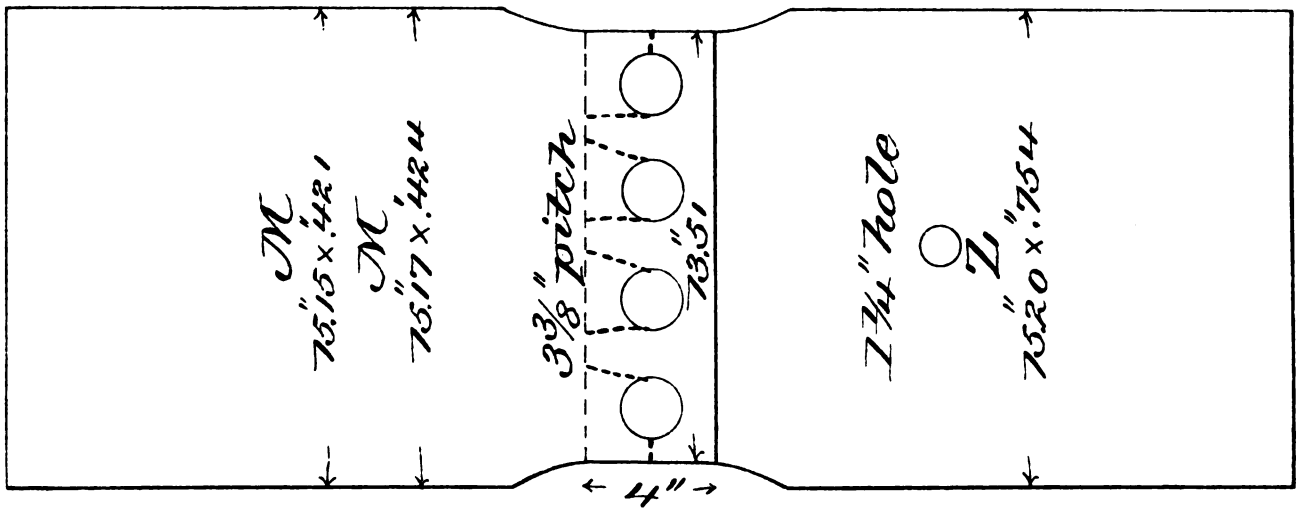
red three sections, and tore out plate at two sections.
ection, silky, slightly lamellar; second section, granular, radi-
m silky metal immediately at side of outside rivet-hole. This
section fractured about $\frac{3}{4}''$ in front of center line of rivet-holes.
ıtion of rivet-holes, ″.90, ″.92, ″.98.

Maximum stress on joint.

ross section of plate	pounds per square inch	40,040
et section of plate	do	63,540
on bearing surface of rivets	do	108,270
rivets	do	40,910

of joint, 67.7 per cent.

No. 1525 plate



H Ex 31 492

Areas.

ross sectional area	square inches	10.187
et sectional area	do	6.417
earing surface of rivets	do	3.770
shearing area	do	9.818

[Steel rivets.]

pplied loads.		In gauged length.		Remarks.
	Per square inch.	Elongation.	Set.	
Pounds.		*Inch.*	*Inch.*	
1,000		0.	0.	Initial load.
2,000		.0001	.....	
3,000		.0004	.....	
4,000		.0007	.....	
5,000		.0009	.0004	
6,000		.0012	.....	
7,000		.0066	.....	
8,000		.0083	.....	
9,000		.0094	.....	
10,000		.0103	.0092	
11,000		.0120	.....	
12,000		.0130	.....	
13,000		.0144	.....	
14,000		.0153	.....	
15,000		.0163	.0147	
16,000		.0173	.....	
17,000		.0188	.....	
18,000		.0208	.....	
19,000		.0235	.....	
20,000		.0261	.0222	
21,000		.0293	.....	
22,000		.0328	.....	
23,000		.0373	.....	
24,000		.0455	.....	
25,000		.0638	.0528	
26,000		.0730	.....	
27,000		.0855	.....	
28,000		.1022	.....	
29,000		.1185	.....	
30,000		.1405	.....	
31,000		.15	.....	
32,000		.18	.....	
33,000		.21	.....	
34,000		.25	.....	
35,000		.29	.....	
36,000		.36	.....	
37,000		.44	.....	
38,000		.54	.....	
39,000		.67	.....	
39,720		.85	.....	Tensile strength.

out plate in front of rivet-holes.
gation of rivet-holes, 1″.01, ″.85, 1″.05, ″.85.

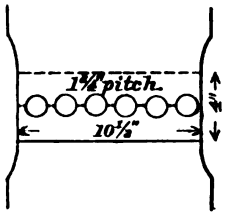
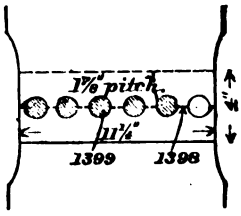
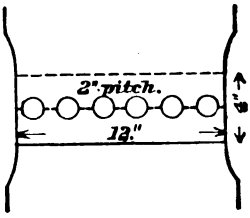
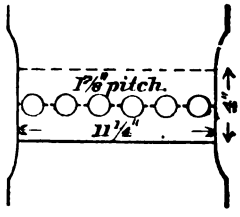
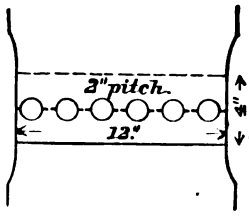
Maximum stress on joint.

n gross section of plate	pounds per square inch	39,720
n net section of plate	do	63,050
on on bearing surface of rivets	do	107,320
n rivets	do	41,210

y of joint, 67.3 per cent.

TABULATION OF S

STEEL PLATE.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.
					Inch.	*Inch.*	*Inch.*
1396 1397	R R	R R	R R		½ ½	5/16 5/16	11/16 and 3/4 11/16 and 3/4
1398 1399	R R	R R	R R		½ ½	5/16 5/16	11/16 and 3/4 11/16 and 3/4
1400 1401	R R	R S	R T		½ ½	5/16 5/16	11/16 and 3/4 11/16 and 3/4
1402 1403	R R	R R	R R		½ ½	5/16 5/16	13/16 and 7/8 13/16 and 7/8
1404 1405	R R	R S	R S		½ ½	5/16 5/16	13/16 and 7/8 13/16 and 7/8

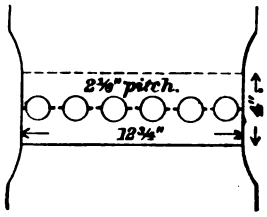
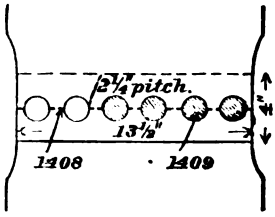
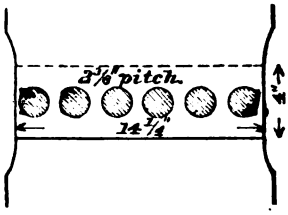
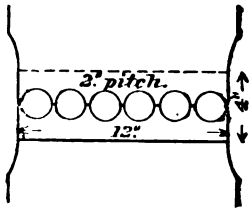
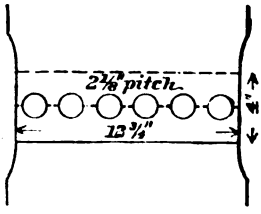
ETED BUTT JOINTS.

STEEL PLATE.

ional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
ss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
051	2.886	2.165	5.301	57,180	37,750	**66,070**	88,080	35,970	66.1	200
082	2.904	2.178	5.301	57,180	38,920	**68,220**	90,960	37,370	68.1	.....
445	3.267	2.178	5.301	57,180	45,560	**75,960**	113,900	46,820	79.6	300
439	3.266	2.173	5.301	57,180	39,200	**65,400**	98,290	**40,290**	68.6	.....
842	3.655	2.187	5.301	57,180	37,000	**59,140**	98,830	40,770	64.7	.....
796	3.622	2.174	5.301	57,180	39,420	**63,080**	105,100	43,100	68.9	350
416	2.891	2.525	7.216	57,180	36,890	**69,110**	79,130	27,690	64.5	.....
477	2.926	5.551	7.216	57,180	38,250	**71,600**	81,730	29,030	66.9	250
832	3.281	2.551	7.216	57,180	37,910	**67,380**	86,670	30,640	66.3	.....
854	3.297	2.557	7.216	57,180	43,730	**77,650**	100,120	35,480	76.4	300

TABULATION OF SI

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.
					Inch.	*Inch.*	*Inch.*
1406 1407	S S	S S	S S		[illegible] [illegible]	[illegible] [illegible]	13 and [illegible] 13 and [illegible]
1408 1409	T T	Q Q	Q Q		[illegible] [illegible]	[illegible] [illegible]	13 and [illegible] 13 and [illegible]
1410 1411	T T	O O	O O		[illegible] [illegible]	[illegible] [illegible]	13 and [illegible] 13 and [illegible]
1412 1413	R R	R R	R R		[illegible] [illegible]	[illegible] [illegible]	15 and 1 15 and 1
1414 1415	S S	S S	S S		[illegible] [illegible]	[illegible] [illegible]	15 and 1 15 and 1

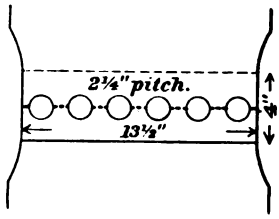
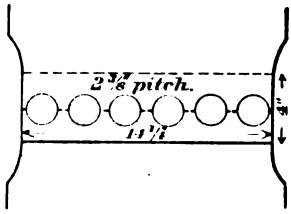
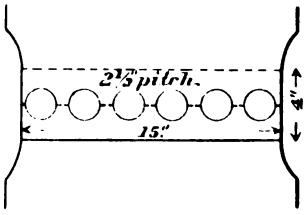
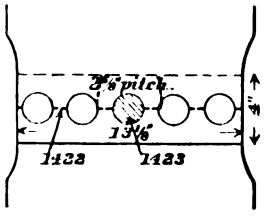
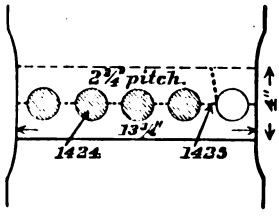
ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

ional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
ss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	Sq. inch.	Sq. inch.	Sq. inch.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Per ct.	
997	3.529	2.468	7.216	59,050	44,790	**76,110**	108,830	37,220	76.0	400
010	3.537	2.473	7.216	59,050	39,210	**66,630**	95,310	32,660	66.3	.....
561	4.010	2.551	7.216	60,000	39,850	**65,210**	102,500	36,230	66.4	.....
512	3.982	2.530	7.216	60,000	46,610	**76,220**	119,980	**42,060**	77.6	500
859	4.334	2.525	7.216	60,000	45,300	71,690	123,050	**43,060**	75.5	350
916	4.370	2.546	7.216	60,000	40,050	63,390	108,800	**38,530**	66.7	.....
813	2.909	2.904	9.425	57,180	35,920	**71,770**	71,900	22,150	62.8	250
772	2.886	2.886	9.425	57,180	34,390	**68,780**	68,780	21,060	60.1	.....
023	3.191	2.832	9.425	59,050	35,000	**66,020**	74,430	22,360	59.2	.....
967	3.159	2.808	9.425	59,050	40,250	**76,030**	85,540	25,480	68.1	300

TABULATION OF S

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.
					Inch.	*Inch.*	*Inch.*
1416 1417	S T	Q Q	Q Q		½ ½	5/16 5/16	15/16 and 1 15/16 and 1
1418 1419	T T	O O	O O		½ ½	5/16 5/16	15/16 and 1 15/16 and 1
1420 1421	U U	P P	P P		½ ½	5/16 5/16	15/16 and 1 15/16 and 1
1422 1423	S S	S S	S S		½ ½	5/16 5/16	15/16 and 1 15/16 and 1
1424 1425	T T	O O	O O		½ ½	5/16 5/16	15/16 and 1 15/16 and 1

:TED BUTT JOINTS—Continued.

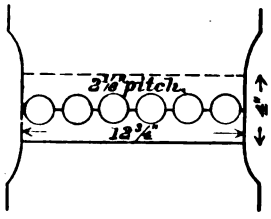
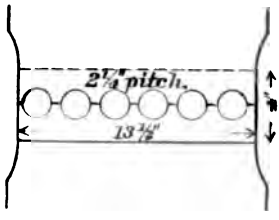
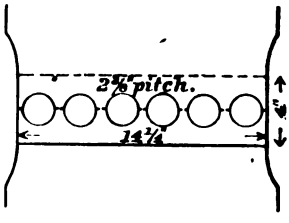
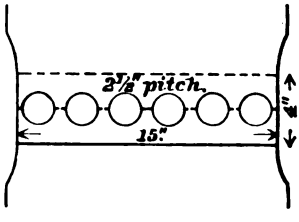
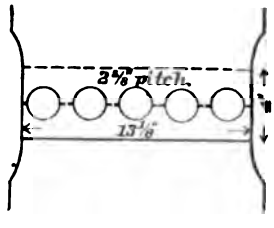
STEEL PLATE—Continued.

ional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
ss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
327	3.519	2.808	9.425	59,050	34,660	**62,320**	78,090	23,160	60.3	**206**
512	3.620	2.892	9.425	60,000	36,950	**66,480**	83,220	25,530	61.5	.....
859	3.973	2.886	9.425	60,000	43,710	**75,460**	103,880	31,810	72.8	(*)
883	3.991	2.892	9.425	60,000	38,720	**66,770**	92,150	28,270	64.5	.....
194	4.320	2.874	9.425	58,000	44,840	**74,670**	112,250	34,230	77.3	(†)
245	4.317	2.898	9.425	58,000	38,740	**64,570**	96,850	29,780	66.9	.....
167	3.822	2.345	7.854	59,050	39,730	**64,110**	104,490	31,200	67.2	.....
220	3.855	2.365	7.854	59,050	45,420	**73,250**	119,450	**35,840**	76.9	400
660	4.240	2.420	7.854	60,000	48,950	**76,890**	137,110	**41,510**	81.5	(‡)
632	4.217	2.415	7.854	60,000	40,600	**63,860**	111,490	34,280	67.6	.....

trained while at the temperature of 400° Fahr. and allowed to cool before rupture.
trained while at the temperature of 500° Fahr. and allowed to cool before rupture.
trained while at the temperature of 500° Fahr., then cooled to 150° Fahr. and ruptured.

TABULATION OF SI

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Ac th pla
					Inch.	*Inch.*	*Inch.*	*Inch*
1426 1427	S R	S S	S S		½ ½	5/16 5/16	1 1/16 and 1¼ 1 1/16 and 1¼	.61 .65
1428 1429	T S	O O	O O		½ ½	5/16 5/16	1 1/16 and 1¼ 1 1/16 and 1¼	.65 .65
1430 1431	U U	O O	O O		½ ½	5/16 5/16	1 1/16 and 1¼ 1 1/16 and 1¼	.48 .52
1432 1433	U U	P P	P P		½ ½	5/16 5/16	1 1/16 and 1¼ 1 1/16 and 1¼	.48 .48
1434 1435	R S	S S	O S		½ ½	5/16 5/16	1 1/16 and 1¼ 1 1/16 and 1¼	.62 .63

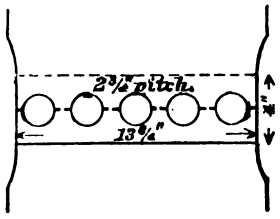
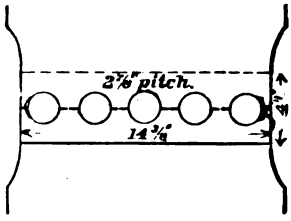
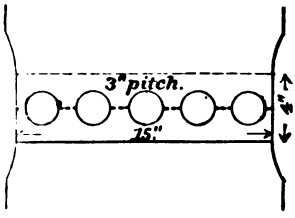
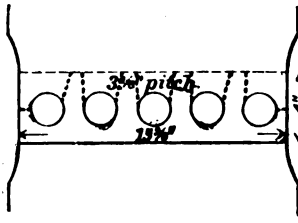
ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

ional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
ss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	Sq. inch.	Sq. inch.	Sq. inch.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Per ct.	
053	2.853	3.200	11.928	50,050	35,070	**74,410**	66,340	18,630	59.3	300
042	2.836	3.206	11.928	59,050	30,420	**64,810**	57,330	15,410	51.5	.....
471	3.238	3.233	11.928	60,000	40,330	**80,620**	80,730	21,880	67.2	350
278	3.139	3.139	11.928	59,050	33,420	**66,840**	66,840	17,590	56.5	.....
897	3.620	3.277	11.928	58,000	36,390	**65,150**	76,500	21,040	62.7	700
892	3.632	3.260	11.928	58,000	33,660	**63,870**	71,160	19,450	58.0	.....
270	4.043	3.227	11.928	58,000	36,140	**65,000**	81,430	22,030	62.3	.....
215	3.968	3.247	11.928	58,000	44,490	**81,050**	99,040	26,960	76.7	500
193	3.538	2.655	9.940	59,050	36,670	**64,190**	85,540	22,850	62.0	.....
232	3.560	2.672	9.940	59,050	36,200	**63,370**	84,420	22,690	61.2	.....

TABULATION OF SINGL

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Covers.		Style of joint.	Nominal thickness. Plate.	Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1436	T	O	O		½	5/16	1 1/16 and 1⅛	.62
1437	T	O	O		½	5/16	1 1/16 and 1⅛	.62
1438	U	P	P		½	5/16	1 1/16 and 1⅛	.64
1439	U	P	P		½	5/16	1 1/16 and 1⅛	.65
1440	U	P	P		½	5/16	1 1/16 and 1⅛	.62
1441	U	P	P		½	5/16	1 1/16 and 1⅛	.63
1442	U	P	P		½	5/16	1 1/16 and 1⅛	.63
1443	U	P	P		½	5/16	1 1/16 and 1⅛	.64

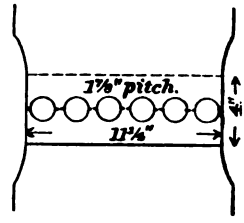
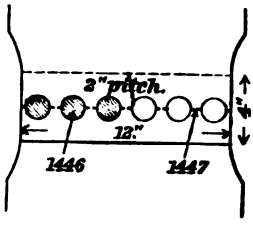
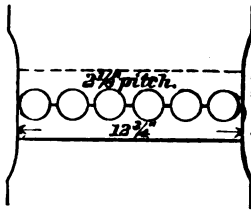
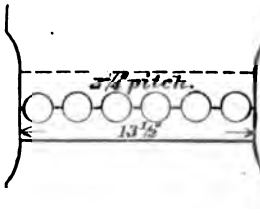
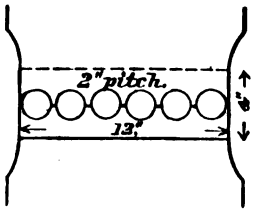
ED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

al area of ate.				Maximum stress on joint per square inch.					
Net.	Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.	Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds*	*Pounds.*	*Per ct.*	
3.921	2.711	9.940	60,000	42,430	**71,610**	103,580	28,250	70.5	500
3.921	2.711	9.940	60,000	38,720	**65,440**	94,730	25,840	64.5	.....
4.247	2,722	9.940	58,000	46,630	**76,550**	119,320	32,680	80.3	500
4.246	2,728	9.940	58,000	38,900	**63,890**	99,440	27,290	67.0	.....
4.519	2.711	9.940	58,000	39.180	**62,690**	104,500	28.500	67.5	200
4.528	2.722	9.940	58,000	40,630	**65,060**	108,220	29,630	70.0	.....
4.837	2.717	9.940	57,410	38,570	60,450	**107,610**	29,410	67.2	.....
4.843	2.722	9.940	57,410	39,160	61,170	**108,830**	29,800	68.2	.....

TABULATION OF SIN

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Ac thi nes pla
					Inch.	*Inch.*	*Inch.*	*Inc*
1444 1445	V V	E B	E E		[illegible] [illegible]	[illegible] [illegible]	[illegible] and [illegible] [illegible] and [illegible]	[illegible] [illegible]
1446 1447	V V	E E	E E		[illegible] [illegible]	[illegible] [illegible]	[illegible] and [illegible] [illegible] and [illegible]	.66 [illegible]
1448 1449	V V	E E	E E		[illegible] [illegible]	[illegible] [illegible]	[illegible] and [illegible] [illegible] and [illegible]	[illegible] [illegible]
1450 1451	W W	F G	G G		[illegible] [illegible]	[illegible] [illegible]	[illegible] and [illegible] [illegible] and [illegible]	[illegible] [illegible]
1452 1453	V V	E E	E E		[illegible] [illegible]	[illegible] [illegible]	[illegible] and 1 [illegible] and 1	[illegible] [illegible]

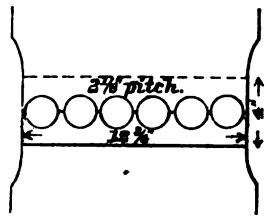
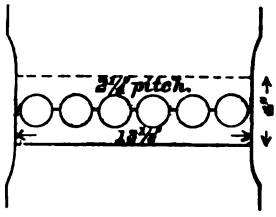
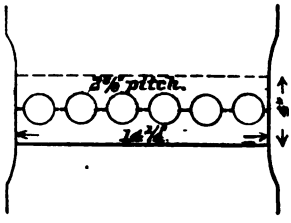
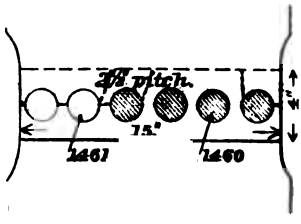
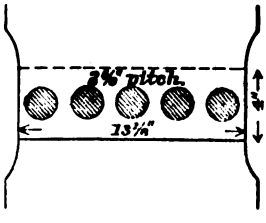
ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

tional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
oss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
986	3.726	3.260	7.216	55,000	33,750	**63,280**	72,330	32,670	60.1	....
020	3.744	3.276	7.216	55,000	34,530	**64,740**	74,000	33,590	62.7	....
392	4.158	3.234	7.216	55,000	36,760	**65,340**	84,010	**37,650**	66.0	....
488	4.212	3.276	7.216	55,000	35,120	**62,440**	80,280	36,440	63.8	....
918	4.658	3.260	7.216	55,000	41,930	**71,270**	101,840	46,010	76.2	300
956	4.680	3.276	7.216	55,000	36,800	**62,560**	89,370	40,570	66.9	....
241	5.039	3.202	7.216	57,290	39,320	**64,290**	101,180	44,900	68.6	400
249	5.042	3.207	7.216	57,290	36,850	**60,290**	94,790	42,120	64.3	600
488	3.744	3.744	9.425	55,000	32,080	**64,150**	64,150	25,480	58.3	....
440	3.720	3.720	9.425	55,000	32,060	**64,110**	64,110	25,300	58.3	....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1454 1455	V V	E E	E E		[illegible] [illegible]	[illegible] [illegible]	15/16 and 1 15/16 and 1	[illegible] [illegible]
1456 1457	W W	G G	F G		[illegible] [illegible]	[illegible] [illegible]	15/16 and 1 15/16 and 1	[illegible] [illegible]
1458 1459	W W	I H	I H		[illegible] [illegible]	[illegible] [illegible]	15/16 and 1 15/16 and 1	[illegible] [illegible]
1460 1461	X X	I J	I I		[illegible] [illegible]	[illegible] [illegible]	15/16 and 1 15/16 and 1	[illegible] [illegible]
1462 1463	V W	F F	F F		[illegible] [illegible]	[illegible] [illegible]	15/16 and 1 15/16 and 1	[illegible] [illegible]

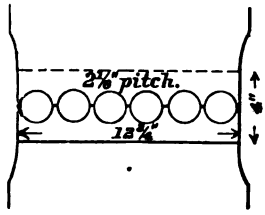
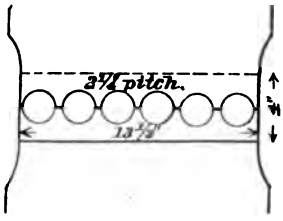
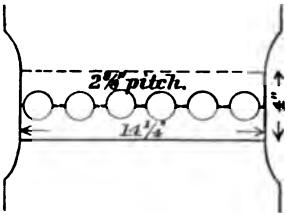
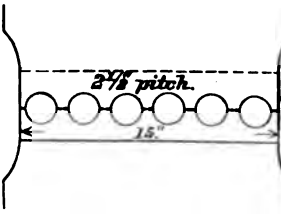
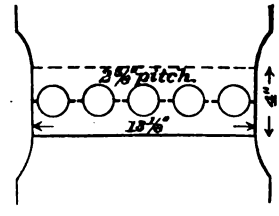
BUTT JOINTS—Continued.

STEEL PLATE—Continued.

a of	Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
'et.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
inch.	Sq. inch.	Sq. inch	Pounds.	Pounds.	Pounds.	Pounds.	Pounds	Per ct.	
.199	3.732	9.425	55,000	34,120	**64,440**	72,510	28,710	60.0	.....
.172	3.708	9.425	55,000	34,000	**64,320**	72,250	28,420	61.8	.....
590	3.672	9.425	57,290	36,490	**65,680**	82,110	32,000	63.6	.....
583	3.666	9.425	57,290	36,020	**64,830**	81,040	31,520	62.8	.....
002	3.660	9.425	57,290	37,720	**65,310**	89,260	38,490	65.8	.....
016	3.648	9.425	57,290	37,540	**64,850**	89,170	34,510	65.5	.....
553	3.702	9.425	55,940	37,300	**62,160**	93,250	**36,630**	66.6	.....
574	3.708	9.425	55,940	37,000	**61,610**	92,620	**36,440**	66.1	.....
100	3.150	7.854	55,000	35,780	57,840	93,810	**37,620**	65.0	.....
025	3.040	7.854	57,290	36,960	59,770	96,840	**37,500**	64.5	.....

TABULATION OF ST

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.
					Inch.	*Inch.*	*Inch.*
1464 1465	V V	E D	E E		[illegible] [illegible]	[illegible] [illegible]	1 1/16 and 1¼ 1 1/16 and 1¼
1466 1467	W W	G N 7/16"	G G		[illegible] [illegible]	[illegible] [illegible]	1 1/16 and 1¼ 1 1/16 and 1¼
1468 1469	W W	H I	I N 7/16"		[illegible] [illegible]	[illegible] [illegible]	1 1/16 and 1¼ 1 1/16 and 1¼
1470 1471	X X	J J	I I		[illegible] [illegible]	[illegible] [illegible]	1 1/16 and 1¼ 1 1/16 and 1¼
1472 1473	V W	K F	..... F		[illegible] [illegible]	[illegible] [illegible]	1 1/16 and 1¼ 1 1/16 and 1¼

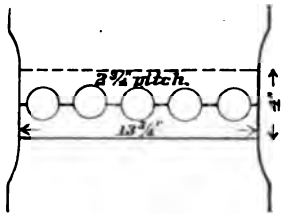
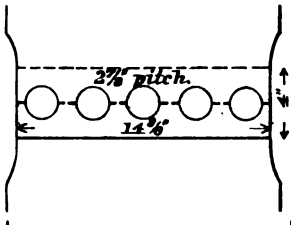
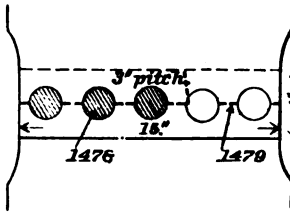
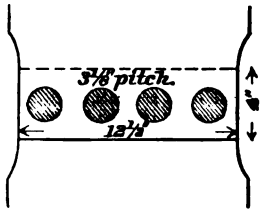
ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

ional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
ss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	Sq. inch.	Sq. inch.	Sq. inch.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Per ct.	
950	3.738	4.212	11.928	55,000	31,090	66,130	58,090	20,720	56.5	.....
949	3.744	4.205	11.928	55,000	31,090	66,020	58,780	20,720	56.5	.....
269	4.131	4.138	11.928	57,290	33,150	66,350	66,240	22,980	57.8	.....
281	4.090	4.091	11.928	55,940	33,240	66,250	66,240	22,720	58.0	.....
735	4.597	4.138	11.928	57,290	34,260	65,110	72,330	25,090	59.8	.....
290	4.579	4.111	11.928	57,290	34,790	66,030	73,540	25,350	60.7	.....
285	5.107	4.178	11.928	55,940	34,980	63,600	77,740	27,230	62.5	.....
240	5.082	4.158	11.928	55,940	34,770	63,220	77,270	26,930	62.1	.....
239	4.706	3.533	9.940	55,000	36,350	63,640	84,770	30,130	66.1	.....
278	4.552	3.426	9.940	57,290	37,100	65,020	86,400	29,780	64.7	.....

TABULATION OF SINGI

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Act thic nes pla
					Inch.	*Inch.*	*Inch.*	*Inc*
1474	W	H	D		[illegible]	[illegible]	1 1/16 and 1 1/8	[illegible]
1475	W	G	.....		[illegible]	[illegible]	1 1/16 and 1 1/8	[illegible]
1476	W	I	I		[illegible]	[illegible]	1 1/16 and 1 1/8	[illegible]
1477	W	I	I		[illegible]	[illegible]	1 1/16 and 1 1/8	[illegible]
1478	X	I	J		[illegible]	[illegible]	1 1/16 and 1 1/8	[illegible]
1479	X	I	J		[illegible]	[illegible]	1 1/16 and 1 1/8	[illegible]
1480	G	E	E		[illegible]	[illegible]	1 1/16 and 1 1/8	[illegible]
1481	H	E	E		[illegible]	[illegible]	1 1/16 and 1 1/8	[illegible]

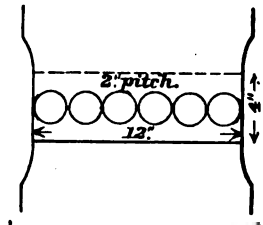
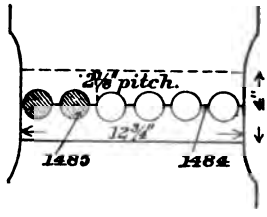
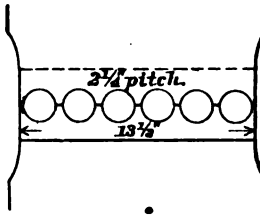
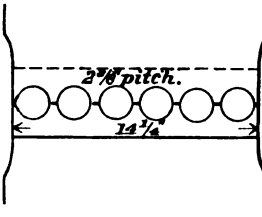
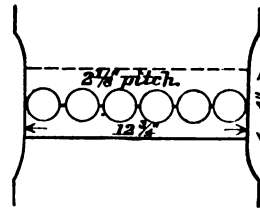
ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

ional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate, per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
ss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	Sq. inch.	Sq. inch.	Sq. inch.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Per ct.	
362	4.936	3.426	9.940	57,290	38,150	**64,630**	93,110	32,090	66.5	.....
381	4.950	3.431	9.940	57,290	38,120	**64,540**	93,120	32,140	66.5	.....
833	5.402	3.431	9.940	57,290	38,620	**63,140**	99,410	34,310	67.4	.....
739	5.313	3.426	9.940	57,290	38,180	**62,830**	97,430	33,580	66.6	.....
240	5.775	3.465	9.940	55,940	38,480	**64,570**	102,630	**35,770**	68.7	.....
345	5.841	3.504	9.940	55,940	38,410	**64,430**	102,440	36,110	68.6	.....
813	5.060	2.813	7.952	55,000	37,340	58,860	103,730	**26,690**	67.9	.....
763	4.968	2.795	7.952	55,000	38,440	60,000	106,700	**37,520**	69.9	.....

TABULATION OF SING

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers	Size of rivets and holes.	Actu thick ness o plate.
					Inch.	*Inch.*	*Inch.*	*Inc*
1482	Z	K	K		[illegible]	7/16	1 1/8 and 1	.75
1483	Z	K	K		[illegible]	7/16	1 1/8 and 1	[illegible]
1484	Z	K	K		[illegible]	7/16	1 1/8 and 1	.76
1485	Z	P	P		[illegible]	7/16	1 1/8 and 1	.76
1486	Z	L	M		[illegible]	7/16	1 1/8 and 1	.76
1487	Z	L	M		[illegible]	7/16	1 1/8 and 1	.76
1488	Z	N	N		[illegible]	7/16	1 1/8 and 1	.76
1489	Z	.O	N		[illegible]	7/16	1 1/8 and 1	.76
1490	Z	K	.....		[illegible]	7/16	1 1/16 and 1 1/8	.72
1491	Z	P	P		[illegible]	7/16	1 1/16 and 1 1/8	.72

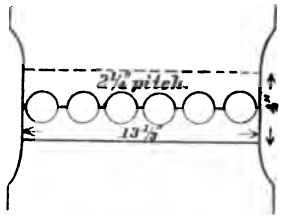
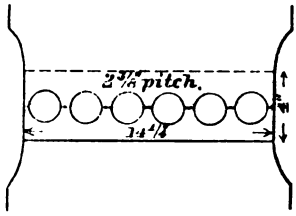
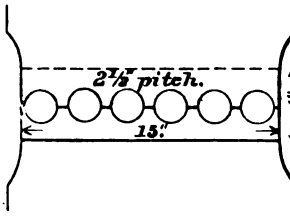
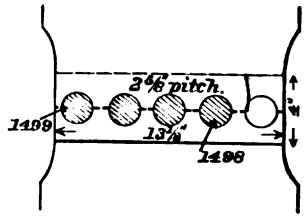
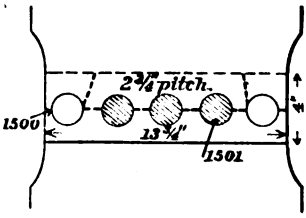
ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

ional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
oss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
847	4.431	4.416	9.425	59,000	31,990	**63,870**	64,090	30,030	54.2	.....
099	4.557	4.542	9.425	59,000	31,980	**63,860**	64,070	30,870	54.2	.....
475	5.023	4.452	9.425	59,000	34,440	**64,960**	73,290	34,620	58.3	.....
723	5.151	4.572	9.425	59,000	34,700	**67,340**	73,790	**35,800**	58.8	.....
112	5.618	4.494	9.425	59,000	35,000	**63,000**	78,750	37,550	59.3	.....
329	5.745	4.584	9.425	59,000	36,780	**66,130**	82,870	40,310	62.3	.....
624	6.154	4.470	9.425	59,000	38,120	**65,810**	90,600	42,970	64.6	.....
488	6.078	4.410	9.425	59,000	34,000	**58,670**	80,860	37,830	57.6	.....
233	4.353	4.880	11.928	59,000	31,050	**65,860**	58,750	24,030	52.6	.....
596	4.520	5.076	11.928	59,000	32,000	**67,940**	65,340	25,740	54.2	.....

TABULATION OF S

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.
					Inch.	*Inch.*	*Inch.*
1492 1493	Z Z	M M	L M		[illegible]	[illegible] [illegible]	1 1/16 and 1 1/8 1 1/16 and 1 1/8
1494 1495	Z Z	N O	O O		[illegible]	[illegible] [illegible]	1 1/16 and 1 1/8 1 1/16 and 1 1/8
1496 1497	Y Y	Q P	P P		[illegible]	[illegible] [illegible]	1 1/16 and 1 1/8 1 1/16 and 1 1/8
1498 1499	Z Z	L L	L L		[illegible]	[illegible] [illegible]	1 1/16 and 1 1/8 1 1/16 and 1 1/8
1500 1501	Z Z	N N	M N		[illegible]	[illegible] [illegible]	1 1/16 and 1 1/8 1 1/16 and 1 1/8

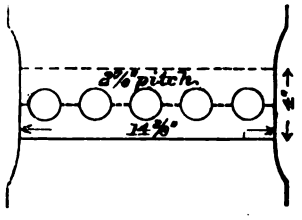
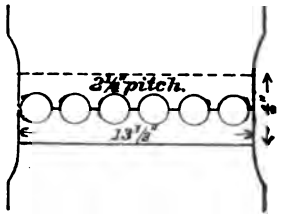
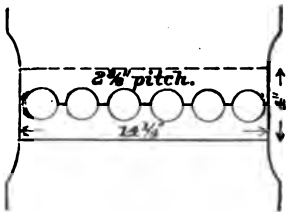
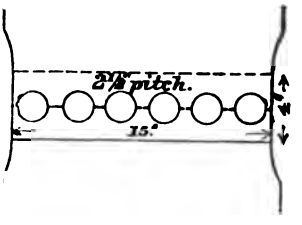
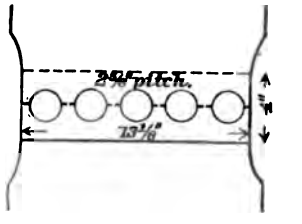
ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

ional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
oss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
951	4.983	4.968	11.928	59,000	34,270	**68,430**	68.640	28.590	58.0	.....
179	5.089	5.090	11.928	59,000	33,770	**67,540**	67,520	28.810	57.2	.....
845	5.715	5.130	11.928	59,000	34,900	**66,230**	73.780	31,730	59.1	.....
838	5.708	5.130	11.928	59,000	35,810	**67,940**	75.650	32.540	60.6	.....
175	6.146	5.029	11.928	60,420	38,470	**69,940**	85,480	36,040	63.6	.....
890	5.996	4.894	11.928	60,420	37,740	**68,650**	83,980	34,460	62.4	.....
624	5.501	4.123	9.940	59,000	35,000	**61,230**	81,700	**33,890**	57.0	.....
776	5.572	4.204	10.030	59,000	36,470	**63,990**	84,810	35,550	61.7	.....
478	6.192	4.286	9.940	59,000	38,760	**65,590**	94,750	40,850	65.7	.....
004	5.915	4.089	9.940	59,000	36,740	**62,130**	89,880	**36,970**	62.2	.....

TABULATION OF ST

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.
					Inch.	*Inch.*	*Inch.*
1502 1503	Z Z	O O	P O		[illegible] [illegible]	7/16 7/16	1 3/16 and 1[illegible] 1 3/16 and 1[illegible]
1504 1505	Z Z	M M	L M		[illegible] [illegible]	7/16 7/16	1 3/16 and 1[illegible] 1 3/16 and 1[illegible]
1506 1507	Y Y	N N	O O		[illegible] [illegible]	7/16 7/16	1 3/16 and 1[illegible] 1 3/16 and 1[illegible]
1508 1509	Y Y	Q Q	Q Q		[illegible] [illegible]	7/16 7/16	1 3/16 and 1[illegible] 1 3/16 and 1[illegible]
1510 1511	Y Y	L L	L L		[illegible] [illegible]	7/16 7/16	1 3/16 and 1[illegible] 1 3/16 and 1[illegible]

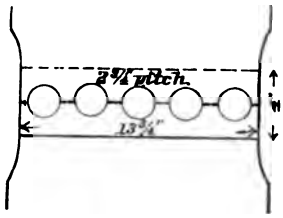
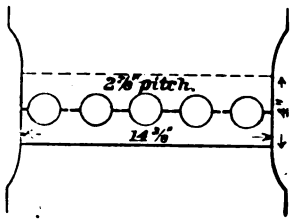
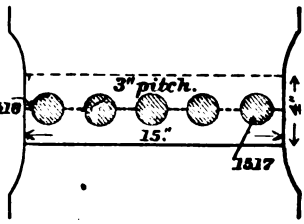
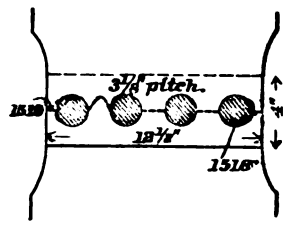
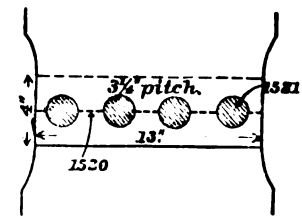
ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

ional area of plate.		Bearing surface of rivets	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
ness.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
inch.	Sq. inch.	Sq. inch.	Sq. inch.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Per ct.	
.390	6.329	4.061	9.940	59,000	37,930	**62,270**	97,070	39,650	64.3	.....
.663	6.495	4.168	9.940	59,000	40,630	**65,810**	90,600	42,970	68.8	.....
.761	4.346	5.415	14.726	59,000	29,090	**65,350**	52,460	19,280	49.3	.....
.287	4.572	5.715	14.726	59,000	30,010	**67,520**	51,010	20,960	50.8	.....
167	4.914	5.453	14.726	60,420	33,610	**70,900**	63,890	23,660	55.6	.....
174	4.961	5.513	14.726	60,420	33,660	**71,070**	63,960	23,940	55.7	.....
170	5.542	5.528	14.726	60,420	34,780	**69,470**	69,650	26,140	57.5	.....
310	5.662	5.648	14.726	60,420	34,670	**69,250**	69,420	26,620	57.4	.....
918	5.243	5.675	12.272	60,420	36,120	**68,380**	76,680	29,210	59.7	.....
928	5.209	4.719	12.272	60,420	36,940	**70,400**	77,710	29,880	61.1	.....

TABULATION OF SING

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Act tha ove pla
					Inch.	Inch.	Inch.	Inc
1512 1513	Z Z	N	N		[illegible] [illegible]	7/16 7/16	1 3/16 and 1 1/4 1 3/16 and 1 1/4	[illegible] [illegible]
1514 1515	Y Y	O O	O O		[illegible] [illegible]	7/16 7/16	1 3/16 and 1 1/4 1 3/16 and 1 1/4	[illegible] [illegible]
1516 1517	Y	P P	P Q		[illegible] [illegible]	7/16 7/16	1 3/16 and 1 1/4 1 3/16 and 1 1/4	[illegible] [illegible]
1518 1519	Z Z	K K	K K		[illegible] [illegible]	7/16 7/16	1 3/16 and 1 1/4 1 3/16 and 1 1/4	[illegible] [illegible]
1520 1521	Z Z	K K	K K		[illegible] [illegible]	7/16 7/16	1 3/16 and 1 1/4 1 3/16 and 1 1/4	[illegible] [illegible]

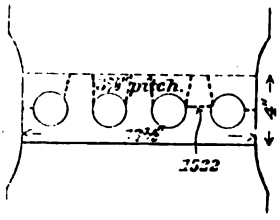
'ETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

tional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
oss.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
nch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
328	5 640	4.688	12.272	59,000	33,730	**61,770**	74,320	28,390	57.0	.....
505	5.730	4.775	12.272	59,000	35,260	**64,640**	77,570	30,100	59.7	.....
929	6.179	4.750	12.272	60,420	37,930	**67,080**	87,200	36,220	62.7	.....
735	6.072	4.663	12.272	60,420	38,720	**68,460**	89,150	33,870	64.0	.....
205	6.524	4.681	12.272	55,520	36,530	**62,740**	87,440	36,610	65.8	.....
108	6.477	4.631	12.272	60,420	38,740	66.440	92,920	**35,060**	64.1	.....
465	5.685	3.780	9.818	59,000	37,560	62.360	93,780	**36,110**	63.6	.....
277	5.572	3.705	9.818	59,000	39,000	**64,930**	97,650	36,850	66.1	.....
934	6.119	3.815	9.818	59,000	37,600	**61,040**	97,900	38,040	63.7	.....
348	5.758	3.590	9.818	59,000	36,000	58,440	93,740	**34,280**	61.0	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters.			Style of joint.	Nominal thickness.		Size of rivets and holes.	Actual thickness of plate.
	Plate.	Covers.			Plate.	Covers.		
					Inch.	*Inch.*	*Inch.*	*Inch.*
1522	Z	M	M		$\frac{3}{4}$	$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.76
1523	Z	M	M		$\frac{3}{4}$	$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.754

NOTE.—The figures in larger type indicate the manner of failure. When different kind of fracture

VETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

ectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
ross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
.inch	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
). 032	6.322	3.710	9.818	59,000	40,040	**63,540**	**108,270**	49,910	67.7	.....
0. 187	6.417	3.770	9.818	59,000	59,720	63,050	**107,320**	41,210	67.3	.....

:urred in the same joint it is indicated by employing larger type in more than one column.

TA

Table of efficienc

STEEL PLATE

Plate.	No. of test.	Pitch of rivets.				
		1⅛″	1¼″	1⅜″	2″	2
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per*
¼″	1398	67.5	68.9	72.8	.....	....
	1313	68.3	69.0	72.1	.....	....
	1314	.....	65.9	66.4	68.3	
	1323	.....	64.8	67.1	68.6	
	1324	.....	.....	62.6	64.4	
	1337	.....	.....	63.9	65.9	
	1338	.....	.....	.....	64.8	
	1355	.....	.....	.....	58.7	
⅜″	1356	74.6	**73.3**	.....	.....	.....
	1359	72.7	**72.0**	.....	.....	....
	1360	.....	68.2	69.0	70.0	
	1367	.....	68.3	70.1	70.3	
	1368	.....	.....	64.5	61.7	
	1379	.....	.....	63.0	65.2	
	1380	.....	.....	.....	58.7	
	1395	.....	.....	.....	57.3	
½″	1396	.....	200 66.1	300 79.6	64.7	.....
	1401	.....	68.1	**68.6**	350 68.9	.....
	1402	.....	.....	64.5	66.3	
	1411	.....	.....	250 66.9	300 76.4	
	1412	.....	.....	.....	250 62.8	
	1425	.....	.....	.....	60.1	
	1426	.....	.....	.....	.....	
	1443	.....	.....	.....	.....	
⅝″	1444	.....	.....	60.1	**66.0**	
	1451	.....	.....	62.7	63.8	
	1452	.....	.....	.....	58.3	
	1463	.....	.....	.....	58.3	
	1464	.....	.....	.....	.....	
	1481	.....	.....	.....	.....	
¾″	1482	.....	.....	.....	54.2	
	1489	.....	.....	.....	54.2	
	1490	.....	.....	.....	.....	
	1503	.....	.....	.....	.....	
	1504	.....	.....	.....	.....	.....
	1523	.....	.....	.....	.....	.....

NOTES.—Figures in heavy-faced type denote the
Super numbers state the temperature of

No. 1.

single-riveted butt joints.

STEEL PLATE.

Pitch of rivets.										Diameter of rivet-holes.
2¼″	2⅜″	2½″	2⅝″	2¾″	2⅞″	3″	3⅛″	3¼″	3⅜″	
Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per cent.*	*Per cent.*	*Per cent.*	*Inches.*
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	⅛
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	⅛
72.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	¼
74.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	¼
70.1	70.7	76.8	69.8	.....	.....	.....	.....	.....	.....	⅜
70.0	72.3	67.1	68.3	.....	.....	.....	.....	.....	.....	⅜
61.5	63.7	72.1	65.4	77.1	73.5	73.7	.....	.....	.....	1
63.4	68.4	68.5	68.4	75.0	74.1	**73.4**	.....	.....	.....	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	⅛
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	⅛
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	¼
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	¼
70.7	72.4	75.5	.....	.....	.....	.....	.....	.....	.....	⅜
68.2	70.4	75.6	.....	.....	.....	.....	.....	.....	.....	⅜
65.4	65.3	69.8	67.4	68.8	73.2	.....	.....	.....	.....	1
64.1	68.3	69.5	68.3	69.8	75.0	.....	.....	.....	.....	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	¾
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	¾
66.4	330 **75.5**	.....	.....	.....	.....	.....	.....	.....	.....	⅞
500 77.6	**66.7**	.....	.....	.....	.....	.....	.....	.....	.....	⅞
200 60.3	400 72.8	500 77.3	67.2	500 81.5	.....	.....	.....	.....	.....	1
61.5	64.5	66.9	400 76.9	67.6	.....	.....	.....	.....	.....	1
350 67.2	700 62.7	62.3	62.0	600 70.5	500 80.3	200 67.5	**67.2**	.....	.....	1⅛
56.5	58.0	500 76.7	61.2	64.5	67.0	70.0	**68.2**	.....	.....	1⅛
400 68.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	⅞
600 64.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	⅞
63.6	65.8	**66.6**	**65.0**	.....	.....	.....	.....	.....	.....	1
62.8	65.5	**66.1**	**64.5**	.....	.....	.....	.....	.....	.....	1
57.8	59.8	62.5	66.1	66.5	67.1	**68.7**	**67.9**	.....	.....	1⅛
58.0	60.7	62.1	64.7	66.5	66.6	68.6	**69.9**	.....	.....	1⅛
59.3	64.6	.....	.....	.....	.....	.....	.....	.....	.....	1
62.3	**57.6**	.....	.....	.....	.....	.....	.....	.....	.....	1
58.0	59.1	63.6	**57.0**	65.7	64.3	.....	.....	.....	.....	1⅛
57.2	60.6	62.4	61.7	**62.2**	68.8	.....	.....	.....	.....	1⅛
49.3	55.6	57.5	59.7	57.0	62.7	65.8	**63.6**	63.7	**67.7**	1¼
50.8	55.7	57.4	61.1	59.7	64.0	**64.1**	66.1	**61.0**	**67.3**	1¼

Joint did not fracture along line of riveting.
Joints tested at temperatures above atmospheric.

TABLE No. 2.

Table of differences between the efficiencies and ratios of net to gross areas.—single-rivet butt joints, steel plate.

Plate.	No. of test.	Width of plate between rivet-holes.									Diameter of rivet-holes.
		1″	1½″	1¼″	1⅜″	1½″	1⅝″	1¾″	1⅞″	2″	
Inch.		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Inches.*
¼	1308	6.0	4.6	6.1	.....	.....	.....	.....	.....	.....	⅝
	1313	6.8	5.6	5.4	.....	.....	.....	.....	.....	.....	⅝
	1314	8.8	6.3	7.2	4.0	7.5	.....	.....	.....	.....	¾
	1323	7.7	7.0	6.1	5.6	8.8	.....	.....	.....	.....	¾
	1324	8.0	8.1	8.6	11.7	7.6	11.8	3.1	.....	.....	⅞
	1337	9.3	9.6	9.4	8.9	9.2	2.1	1.6	.....	.....	⅞
	1338	14.8	8.8	5.9	5.8	12.1	3.5	13.4	8.2	7.0	1
	1355	18.8	7.6	7.8	10.5	8.5	6.6	11.3	8.8	**6.7**	1
⅜	1356	13.1	**9.1**	.....	.....	.....	.....	.....	.....	.....	⅝
	1359	11.2	**7.7**	.....	.....	.....	.....	.....	.....	.....	⅝
	1360	11.1	9.0	7.5	6.2	.....	.....	.....	.....	.....	¾
	1367	11.2	10.1	7.8	**3.8**	.....	.....	.....	.....	.....	¾
	1368	11.2	5.4	5.9	9.6	9.4	10.5	.....	.....	.....	⅞
	1379	9.7	8.9	8.6	7.1	7.2	10.6	.....	.....	.....	⅞
	1380	6.8	6.7	9.9	7.4	9.8	5.5	5.2	7.9	.....	1
	1395	7.3	6.6	5.9	10.4	9.5	6.4	6.2	9.8	.....	1
½	1396	200 9.0	300 19.6	2.1	.....	.....	.....	.....	.....	.....	¾
	1401	11.1	**8.6**	350 6.4	.....	.....	.....	.....	.....	.....	¾
	1402	11.1	10.0	400 17.2	5.3	350 **12.3**	.....	.....	.....	.....	⅞
	1411	250 13.5	300 20.1	7.4	500 16.4	**3.5**	.....	.....	.....	.....	⅞
	1412	250 12.8	6.2	200 4.7	400 14.9	500 17.2	5.2	500 17.8	.....	.....	1
	1425	10.1	300 15.2	5.9	6.5	6.9	400 14.9	4.0	.....	.....	1
	1426	300 12.2	350 17.2	700 10.2	6.9	4.9	600 11.4	500 19.4	200 5.0	**3.2**	1⅛
	1443	4.6	6.5	5.3	500 21.7	4.1	5.4	6.1	7.5	**4.2**	1⅛
⅝	1444	6.4	**9.7**	300 17.4	400 7.5	.....	.....	.....	.....	.....	⅞
	1451	9.4	7.5	**8.1**	600 3.2	.....	.....	.....	.....	.....	⅞
	1452	8.3	7.1	8.0	8.1	**6.6**	**3.1**	.....	.....	.....	1
	1463	8.3	8.9	7.2	7.6	**6.0**	**2.7**	.....	.....	.....	1
	1464	9.5	7.8	7.2	7.5	9.0	7.5	6.2	**6.2**	**3.9**	1⅛
	1481	9.4	8.0	8.0	7.1	7.6	7.4	5.8	6.1	**5.9**	1⅛
¾	1482	4.1	5.3	**3.7**	6.7	.....	.....	.....	.....	.....	1
	1489	4.1	5.8	6.0	**—0.4**	.....	.....	.....	.....	.....	1
	1490	5.5	7.9	6.4	8.6	**—.02**	6.6	3.4	.....	.....	1⅛
	1503	7.1	7.2	7.9	7.3	4.7	**3.1**	7.9	.....	.....	1⅛
	1504	4.8	8.2	7.4	6.8	2.4	6.2	7.6	**3.5**	2.1	1¼
	1521	6.4	8.3	7.3	8.6	5.1	7.4	**5.8**	6.0	**—0.6**	1¼
										2½″	
										Pr. ct.	
	.....	.....	.....	.....	.....	.....	.....	.....	.....	**4.7**	
	.....	.....	.....	.....	.....	.....	.....	.....	.....	**4.3**	

NOTES.—Figures in heavy-faced type denote that joint did not fracture along line of riveting.
Super numbers state the temperature of joints tested at temperatures above atmospheric.

TABLE No. 3.

Excess in strength of net section in joint over strength of tensile test strip—single-riveted butt joints, steel plate.

Plate.	No. of test.	Width of plate between rivet-holes.									Diameter of rivet holes.
		1″	1 1/8″	1 1/4″	1 3/8″	1 1/2″	1 5/8″	1 3/4″	1 7/8″	2″	
Inch.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Inch.*
1/4	1308	9.8	7.2	9.1	.....	.....	.....	.....	.....	.....	5/8
	1313	11.1	8.8	8.1	.....	.....	.....	.....	.....	.....	5/8
	1314	15.4	10.5	9.2	6.2	9.1	.....	.....	.....	.....	3/4
	1323	13.4	11.7	9.7	8.5	11.0	.....	.....	.....	.....	3/4
	1324	17.4	14.4	14.7	14.7	11.9	16.1	4.7	.....	.....	7/8
	1337	19.7	17.0	15.9	14.6	14.4	3.2	2.5	.....	.....	7/8
	1338	29.6	16.5	10.6	10.0	20.1	5.6	21.0	12.7	10.6	1
	1355	17.6	14.5	14.2	18.0	14.1	10.7	17.7	13.5	**10.1**	1
3/8	1356	21.2	**14.1**	.....	.....	.....	.....	.....	.....	.....	5/8
	1359	18.1	**11.9**	.....	.....	.....	.....	.....	.....	.....	5/8
	1360	19.3	15.0	12.0	9.6	.....	.....	.....	.....	.....	3/4
	1367	19.5	16.8	12.5	**5.8**	.....	.....	.....	.....	.....	3/4
	1368	20.9	9.7	10.1	15.6	14.9	16.1	.....	.....	.....	7/8
	1379	18.2	15.9	13.5	11.7	11.4	16.5	.....	.....	.....	7/8
	1380	15.5	12.6	17.8	12.8	16.3	8.9	8.2	12.2	.....	1
	1395	14.6	12.5	10.6	17.9	15.9	10.3	9.8	15.1	.....	1
1/2	1396	200 15.6	300 32.8	3.4	.....	.....	.....	.....	.....	.....	3/4
	1401	15.8	**14.4**	350 10.3	.....	.....	.....	.....	.....	.....	3/4
	1402	20.9	17.8	400 28.9	8.7	350 **19.5**	.....	.....	.....	.....	7/8
	1411	250 25.2	300 35.8	12.8	500 27.0	**5.6**	.....	.....	.....	.....	7/8
	1412	250 25.5	11.8	200 5.5	400 25.8	500 28.7	8.6	500 28.1	.....	.....	1
	1425	20.3	300 28.8	10.8	11.3	11.3	400 24.0	6.4	.....	.....	1
	1426	300 26.0	350 34.4	700 12.3	12.1	8.7	600 19.4	500 32.0	200 8.1	**5.3**	1 1/8
	1443	9.8	13.2	10.1	500 39.7	7.3	9.1	10.1	12.2	**6.5**	1 1/8
5/8	1444	15.1	**18.8**	300 29.6	400 12.2	.....	.....	.....	.....	.....	7/8
	1451	17.7	13.5	**13.7**	600 5.2	.....	.....	.....	.....	.....	7/8
	1452	16.6	17.2	14.6	14.0	**11.1**	**5.2**	.....	.....	.....	1
	1463	16.6	16.8	13.2	13.2	**10.1**	**4.3**	.....	.....	.....	1
	1464	20.2	15.8	13.6	13.7	15.7	12.8	10.2	**10.1**	**6.1**	1 1/8
	1481	20.0	18.4	15.3	13.0	13.5	12.7	9.7	9.8	**9.2**	1 1/8
3/4	1482	8.3	10.1	**6.8**	11.5	.....	.....	.....	.....	.....	1
	1489	8.2	**14.1**	12.1	**—0.6**	.....	.....	.....	.....	.....	1
	1490	11.6	16.0	12.3	15.8	**3.8**	11.2	5.5	.....	.....	1 1/8
	1503	15.2	14.5	15.2	13.6	8.5	**5.3**	11.5	.....	.....	1 1/8
	1504	10.8	17.4	15.0	13.2	4.7	11.0	13.0	**5.7**	3.5	1 1/4
	1521	14.4	17.6	14.6	16.5	9.6	13.3	**10.0**	10.1	**—0.9**	1 1/4
										2 1/8″	1 1/4
										Per ct.	1 1/4
	.....	.....	.....	.....	.....	.....	.....	.....	.....	**7.7**	1 1/4
	.....	.....	.....	.....	.....	.....	.....	.....	.....	**6.9**	
Average of all joints		16.2	14.4	12.3	12.9	11.9	11.0	9.7	11.8	7.0	

NOTES.—Figures in heavy-faced type denote that joint did not fracture along line of riveting.
Super numbers state the temperature of joints tested at temperatures above atmospheric.

TABLE No. 4.

Compression on bearing surface of rivets and excess in tensile strength of net section of plate—single-riveted butt joints, steel plate.

Plate.	No. of test.	Rivet-holes.	Net width of plate.	Compression on bearing surface per square inch.	Excess tensile strength.
Inch.		*Inch.*	*Inch.*	*Pounds.*	*Per cent.*
1/4	1309	5/8		109,640	11.1
	1308	5/8		108,370	9.8
	1314	3/4		94,890	15.4
	1315	3/4		93,330	13.4
	1325	7/8		84,510	19.7
	1324	7/8		92,870	17.4
	1339	1		72,580	17.6
3/8	1356	5/8		105,170	21.2
	1357	5/8		102,490	18.1
	1361	3/4		86,430	19.5
	1360	3/4		86,330	19.3
	1368	7/8		75,000	20.9
	1369	7/8		73,150	18.2
	1380	1		69,010	15.5
	1381	1		66,880	14.6
1/2	1397	3/4	1	90,960	15.8
	1402	7/8		79,130	20.9
	1413	1		68,780	20.3
	1427	1 1/4		57,330	9.8
5/8	1445	7/8		74,000	17.7
	1444	7/8		72,330	15.1
	1452	1		64,150	16.6
	1453	1		64,110	16.6
	1465	1 1/8		58,780	20.0
	1464	1 1/8		58,690	20.2
3/4	1491	1 1/8		65,340	15.2
	1482	1		61,090	8.3
	1483	1		64,070	8.2
	1490	1 1/8		58,750	11.6
	1505	1 1/4		54,010	14.4
	1504	1 1/4		52,460	10.8
1/4	1311	5/8		119,810	8.8
	1310	5/8		119,180	7.2
	1317	3/4		103,750	11.7
	1316	3/4		102,630	10.5
	1327	7/8		94,480	17.0
	1326	7/8		92,210	14.4
	1340	1		82,150	16.5
	1341	1		80,820	14.5
3/8	1363	3/4		95,130	16.8
	1362	3/4		93,620	15.0
	1371	7/8		89,000	15.9
	1370	7/8		84,280	9.7
	1382	1		75,640	12.6
	1383	1	1 1/8	73,800	12.5
1/2	1404	7/8		86,670	17.8
	1414	1		74,430	11.8
	1429	1 1/8		66,840	13.2
5/8	1447	7/8		80,280	13.5
	1454	1		72,510	17.2
	1455	1		72,250	16.8
	1466	1 1/8		66,240	15.8
	1467	1 1/8		66,240	18.4
3/4	1484	1		73,200	10.1
	1492	1 1/8		68,640	16.0
	1493	1 1/8		67,520	14.5
	1507	1 1/4		63,960	17.6
	1506	1 1/4		63,890	17.4

Plate.	No. of test.	Rivet-holes.	Net width of plate	Compression on bearing surface per square inch.	Excess tensile strength.
Inch.		*Inch.*	*Inch.*	*Pounds.*	*Per cent.*
1/4	1312	5/8		134,750	9.1
	1313	5/8		133,720	8.1
	1319	3/4		114,750	9.7
	1318	3/4		112,610	9.2
	1329	7/8		103,860	15.9
	1328	7/8		102,810	14.7
	1343	1		87,750	14.2
	1342	1		85,130	10.6
3/8	1365	3/4		112,000	12.5
	1364	3/4		111,510	12.0
	1373	7/8		94,580	13.5
	1372	7/8		94,210	10.1
	1385	1		80,570	10.6
	1384	1		79,810	17.8
1/2	1400	3/4	1 1/4	98,830	3.4
	1407	7/8		95,310	12.8
	1417	1		83,220	10.8
	1431	1 1/8		71,160	10.1
5/8	1456	1		82,110	14.0
	1457	1		81,040	13.2
	1469	1 1/8		73,540	15.3
	1468	1 1/8		72,330	13.6
3/4	1487	1		82,870	12.1
	1495	1 1/8		75,650	15.2
	1404	1 1/8		73,780	12.5
	1508	1 1/4		69,650	15.0
	1509	1 1/4		69,420	14.6
1/4	1321	3/4		124,880	8.5
	1320	3/4		122,140	6.2
	1330	7/8		110,830	13.7
	1331	7/8		106,620	14.6
	1345	1		96,070	18.0
	1344	1		92,870	10.6
3/8	1366	3/4		116,340	9.6
	1375	7/8		102,360	11.7
	1374	7/8		97,620	15.6
	1386	1		87,910	12.8
	1387	1		87,350	17.9
1/2	1408	7/8	1 3/8	102,500	8.7
	1419	1		92,150	11.5
	1432	1 1/8		81,430	12.1
5/8	1458	1		89,260	14.0
	1459	1		89,170	13.2
	1470	1 1/8		77,740	13.7
	1471	1 1/8		77,270	13.0
3/4	1488	1		90,600	11.5
	1496	1 1/8		85,480	15.8
	1497	1 1/8		83,980	13.6
	1511	1 1/4		77,710	16.5
	1510	1 1/4		76,680	13.2
1/4	1323	3/4	1 1/2	131,460	11.0
	1322	3/4		129,150	9.0
	1333	7/8		116,070	14.4
	1332	7/8		113,500	11.9
	1346	1		108,960	20.1
	1347	1		103,540	14.1

Compression on bearing surface of rivets, etc.—Continued.

Plate.	No. of test.	Rivet-holes.	Net width of plate.	Compression on bearing surface per square inch.	Excess tensile strength.	Plate.	No. of test.	Rivet-holes	Net width of plate.	Compression on bearing surface per square inch.	Excess tensile strength.
Inch.		*Inch.*	*Inch.*	*Pounds.*	*Per cent.*	*Inch.*		*Inch.*	*Inch.*	*Pounds.*	*Per cent.*
$\frac{3}{8}$	1377	$\frac{7}{8}$	$1\frac{1}{8}$	108,260	11.4	$\frac{3}{4}$	1500	$1\frac{1}{8}$	$1\frac{5}{8}$	94,750	11.2
	1376	$\frac{7}{8}$		105,470	14.9		1515	$1\frac{1}{4}$		89,150	13.3
	1388	1		93,710	16.3		1514	$1\frac{1}{4}$		87,260	11.0
	1389	1		93,390	15.9						
$\frac{1}{2}$	1421	1		96,850	11.3	$\frac{1}{4}$	1327	$\frac{7}{8}$	$1\frac{3}{4}$	125,990	2.7
	1434	$1\frac{1}{8}$		85,540	8.7		1336	$\frac{7}{8}$		124,020	4.7
	1435	$1\frac{1}{8}$		84,420	7.3		1350	1		118,300	21.0
							1351	1		114,980	17.7
$\frac{5}{8}$	1473	$1\frac{1}{8}$		86,400	13.5	$\frac{3}{8}$	1393	1		111,070	9.8
	1472	$1\frac{1}{8}$		84,770	15.7		1392	1		109,540	8.2
$\frac{3}{4}$	1499	$1\frac{1}{8}$		84,810	8.5	$\frac{1}{2}$	1425	1		111,490	6.4
	1513	$1\frac{1}{4}$		77,570	9.6		1439	$1\frac{1}{8}$		99,450	10.1
	1512	$1\frac{1}{4}$		74,320	4.7						
						$\frac{5}{8}$	1476	$1\frac{1}{8}$		99,410	10.2
							1477	$1\frac{1}{8}$		97,430	9.7
						$\frac{3}{4}$	1502	$1\frac{1}{8}$		97,050	5.5
							1503	$1\frac{1}{8}$		90,600	11.5
							1516	$1\frac{1}{4}$		87,440	13.0
$\frac{1}{4}$	1334	$\frac{7}{8}$	$1\frac{5}{8}$	127,550	16.1	$\frac{1}{4}$	1353	1	$1\frac{7}{8}$	126,160	13.5
	1335	$\frac{7}{8}$		123,030	3.2		1352	1		125,220	12.7
	1349	1		112,380	10.7						
	1348	1		101,620	5.6						
$\frac{3}{8}$	1379	$\frac{7}{8}$		116,280	16.5	$\frac{3}{8}$	1395	1		115,660	15.1
	1378	$\frac{7}{8}$		115,680	16.1		1394	1		113,240	12.2
	1391	1		103,600	10.3						
	1390	1		102,340	8.9						
$\frac{1}{2}$	1422	1		104,490	8.6	$\frac{1}{2}$	1441	$1\frac{1}{8}$		108,220	12.2
	1437	$1\frac{1}{8}$		94,730	9.1	$\frac{5}{8}$	1479	$1\frac{1}{8}$		102,440	9.8
						$\frac{3}{4}$	1519	$1\frac{1}{4}$		97,650	10.1
$\frac{5}{8}$	1475	$1\frac{1}{8}$		93,120	12.7	$\frac{1}{4}$	1354	1	2	133,730	10.6
	1474	$1\frac{1}{8}$		93,110	12.8	$\frac{3}{8}$	1520	$1\frac{1}{4}$		97,900	3.5

SHEET O.—$\frac{5}{16}$″ *steel plate.*

1235						
1424	1437	1437	1436	1430	1419	1419
1429	1425	1425	1424	1411	1410	1418

1431	1430	1410	1240
1431	1411	1418	

SHEET P.—$\frac{5}{16}$″ *steel plate.*

1236						
1439	1438	1441	1421	1432	1440	1420
1439	1438	1433	1420	1432	1440	1421

1441	1442	1442	1241
1433	1443	1443	

SHEET Q.—$\frac{5}{16}''$ *steel plate.*

							1234	
1434	1436	1417	1409	1428	1408	1416	1408	b

					1239	
1429	1416	1409	1417	1428		

SHEET R.—$\frac{5}{16}''$ *steel plate.*

				1232			
1397	1396	1399	1399	1398	1398	1404	a
1397	1396	1402		1402	1403	1403	

1400	1404	1412	1413		1237
1412	1413	1400	1401		

a

SHEET S.—$\frac{7}{16}''$ *steel plate.*

						1233	
1401	1426	1407	1426	1414	1415	1427	1435
1405	1405	1406	1407	1414	1415	1427	1406

1422	1434	1435
1422	1423	1423

SHEET I.—$\frac{3}{8}''$ *steel plate.*

1460						1477
					1260	
1478	1470	1471	1479	1460	1461	1476

1477	1458	1469
1476	1458	1468

SHEET J.—$\frac{3}{8}''$ *steel plate.*

1479	1470	1261		
1461	1471	1478	1251	

SHEET K.—$\frac{7}{16}''$ *steel plate.*

1518	1519	1520	1521	1484	1521	1483	1483	1270
1519	1518	1490	1484	1521	1472	1486	1486	
						1262		

SHEET L.—$\frac{7}{16}''$ *steel plate.*

	1263					1271
1498	1511	1498	1511	1492	1487	
1490	1510	1499		1486		

SHEET M.—$\frac{7}{16}''$ *steel plate.*

1500	1487	1522	1505	1493	1523	1272
1264	1522	1498	1504	1505	1492	

SHEET N.—$\frac{7}{16}''$ *steel plate.*

1501	1469	1500	1506	1488	1494	1265		
1501	1513	1467	1513	1488	1507	1489	1273	

SHEET O.—$\frac{7}{16}''$ *steel plate.*

	1266					
1495	1489	1503		1515	1514	1515
1506	1494	1495	1514	1503	1502	1507

SHEET P.—$\frac{7}{16}''$ *steel plate.*

1491	1485	1485	1491			
					1267	
1502	1497	1516	1517	1516	1497	1496

SHEET Q.—$\frac{7}{16}''$ *steel plate.*

	1509	1508	1517	1508	1509
		1268			

SHEET R.—$\frac{1}{2}''$ *steel plate.*

			1281			
1397	1403	1402	1400	1405	1412	1277
1396	1398	1399	1413	1404	1401	

SHEET S.—½″ *steel plate.*

	1282					
1406	1427	1426	1435	1423	1416	1278
1415	1414	1407	1434	1422	1429	

SHEET T.—½″ *steel plate.*

	1283					
1408	1417	1437	1436	1411	1419	1279
1409	1428	1425	1424	1418		

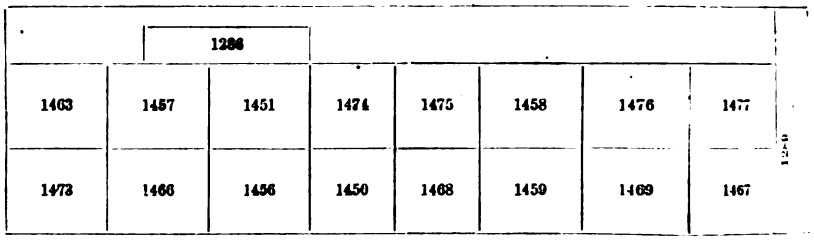
SHEET U.—½″ *steel plate.*

	1443	1441	1440	1421	1439	1438	1280
1284		1432	1420	1433	1431	1430	

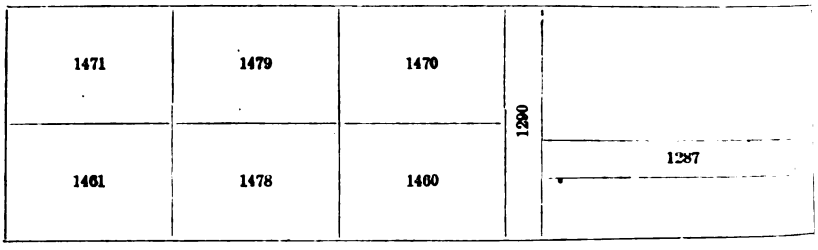
SHEET V.—⅝″ *steel plate.*

	1285						
15	1447	1452	1481	1448	1465	1464	1462	1288
14	1453	1446	1480	1455	1454	1449	1472	

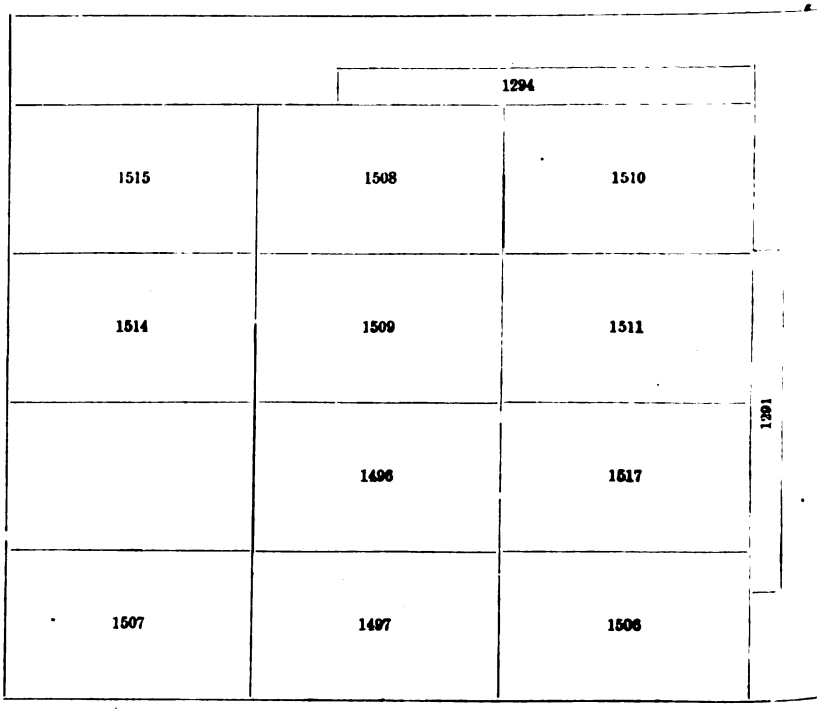
SHEET W.—$\frac{5}{8}''$ *steel plate.*



SHEET X.—$\frac{5}{8}''$ *steel plate.*



SHEET Y.—$\frac{3}{4}''$ *steel plate.*



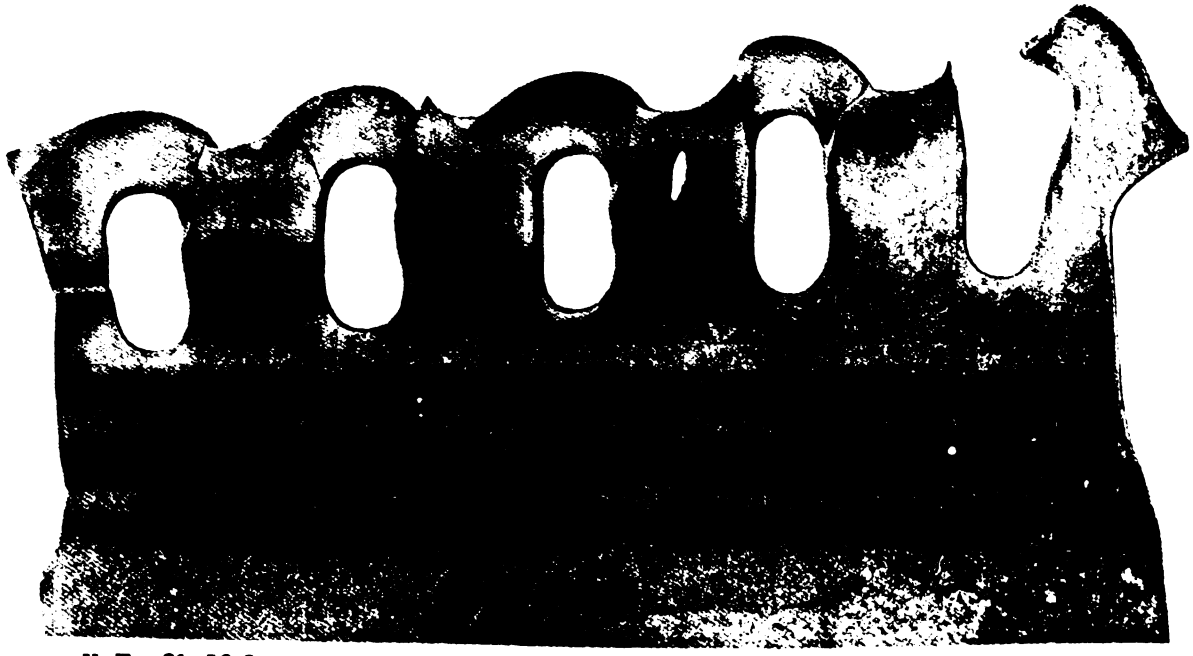
SHEET Z.—¾″ *steel plate.*

			1293			
1484	1498	1492	1522	1503	1489	
1520	1491		1505	1500	1495	
1485	1518	1523	1487	1513	1494	1292
1483	1519	1499	1512	1512	1488	
1482	1521	1490	1504	1501	1502	

PHOTOGRAPH OF A SHEARED RIVET.

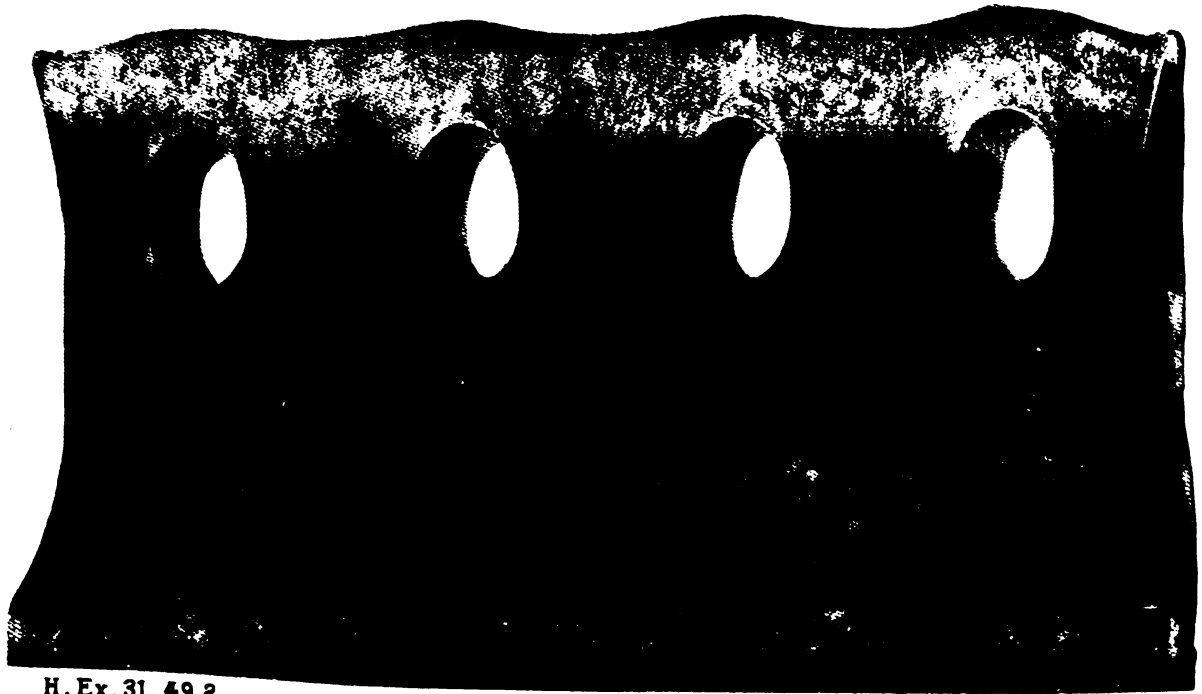
H.Ex.31.49.2.

PHOTOGRAPH OF PLATE FROM JOINT NO. 1443.
AFTER THE TEST.



H. Ex. 31. 49. 2.

PHOTOGRAPH OF PLATE FROM JOINT NO. 1481.
AFTER THE TEST.



H. Ex. 31. 49.2.

TENSILE TESTS

OF

STEEL AND WROUGHT-IRON EYE-BARS.

TENSILE TESTS OF STEEL AND WROUGHT-IRON EYE-BARS.

The steel eye-bars were furnished by General C. P. Stone, chief engineer for the American committee of the Statue of Liberty; the wrought-iron eye-bars by Mr. J. T. Furber, general manager of the Boston and Maine Railroad Company.

In addition to the data usually obtained from tensile tests, special attention was given to the change in the modulus of elasticity of the metal which occurs after the primitive elastic limit has been passed.

Previous observations of this nature are recorded in Report of Tests, 1883, pages 197, 200, and 207.

The modulus of elasticity under different loads, either ascending or descending, is nearly constant within the primitive elastic limit.

When a load is applied which exceeds the elastic limit sufficient to cause considerable stretch of the metal, there is a reduction in the modulus of elasticity, this property being then affected not only by loads above the primitive elastic limit but also by loads below that limit. Under ascending loads the value of the modulus of elasticity diminishes, reaching its minimum value with the last increment of load.

Under descending loads the material does not return over the same curve which the ascending loads traced, but the maximum value of the modulus of elasticity is found with the first decrement of load, the value diminishing as the loads are released. The upward and downward curves closely resemble each other, the maximum curvature being at the terminating ends, one curve being nearly the reverse of the other.

While the bar is in this state it is seen there is an apparent loss of mechanical work in stretching the metal and its recovery, represented by the area between the ascending and descending curves.

When the bar is carrying the maximum load, if the load is released a few thousand pounds and then applied again, a high value of the modulus of elasticity is obtained, both descending and ascending. If, however, the load is released to zero momentarily and quickly re-applied, the metal shows a low value of the modulus of elasticity when the higher loads are reached.

These values depend upon the total range of stresses to which the metal is subjected. The results are not materially changed if the bar sustains a high load several hours.

Allowing a short period of rest after each increment or decrement of load produces a slight addition to the elongations in the one case and to the recoveries in the other, this additional movement becoming more prominent as the range of stresses increases.

These changes in the modulus of elasticity which follow the displacement of the metal by stretching are temporary, from which the bars recover after a period of rest, the wrought-iron bars recovering a uniform modulus of elasticity sooner than the steel.

Alternate loadings by tension and compression of a section of the stem of wrought-iron eye-bar No. 767, after a long interval of rest, showed that a uniform modulus of elasticity prevailed over a range of stresses of 70,000 pounds per square inch. The deflection of the bar

under compression loads accounts for the compression measurements being less than the elongations for equal increments of load, as the micrometer was located on the convex side of the bar.

The sectional areas of the bars were first determined by calipering. After stretching they were computed on the assumption that the volumes remained constant, and that the sectional areas diminished in the same proportion as the stems elongated.

It is known, however, that the volume does not remain constant, but increases when the metal is strained beyond the elastic limit. Data are not available showing to what extent the change in specific gravity takes place, hence no correction of areas is attempted.

Specific gravity specimens taken from fractured bar No. 4137 gave the following results:

Condition of specimen.	Specimen *a*.		Specimen *b*.	
	Specific gravity.	Differences.	Specific gravity.	Differences.
As taken from fractured bar	7.8556	.....	7.8563	.....
Annealed	7.8595	.0039	7.8604	.0041
Compressed with 70,000 pounds per square inch	7.8589	.0006	7.8561	.0043
Annealed	7.8597	.0008	7.8582	.0021
Hardened	7.8490	.0107	7.8452	.0130
Annealed	7.8581	.0091	7.8591	.0139

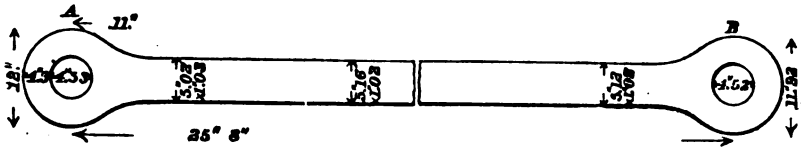
The specific gravity specimens were cylindrical, ″.90 diameter by 1″ long, the axis of the cylinders being at right angles to the length of the stem of the eye-bar.

The compression of the specimens after the first annealing was lengthwise the cylinders, hence at right angles to the direction of the tensile stress on the bar. The effect of tension or compression loads is to diminish the specific gravity, and annealing increases the same.

A more decided reduction in specific gravity is effected by hardening, the effects of which are again removed by annealing.

DETAILS OF TESTS OF STEEL EYE-BARS.

No. 4134.



Sectional area of stem, 5.26 square inches.
Gauged length, 260″.
Thirty 10″ sections laid off on stem of bar.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	
5,260	1,000	0.	0.	0.	Initial load.
26,300	5,000	.0535	.....	.....	
52,600	10,000	.1024	.0088	.....	
78,900	15,000	.1485	.0100	.....	E = 28,953,000.
105,200	20,000	.1930	.0107	.....	E = 29,680,000.
131,500	25,000	.2405	.0140	.....	E = 29,411,000.
157,800	30,000	.2894	.0215	.....	E = 31,400,900.
170,000	.....	.3142	.....	.....	
172,000	.....	.3173	.....	.....	
174,000	.....	.3221	.....	.....	
176,000	.....	.3267	.....	.....	
178,000	.....	.3320	.....	.....	
180,000	.....	.3383	.....	.....	
182,000	34,610	.3435	.....	.....	Elastic limit.
184,100	35,000	.4025	.0890	.....	
186,000	.....	.4760	.....	.....	
188,000	.....	.5270	.....	.....	
189,360	36,000	.5890	.....	.....	
194,620	37,000	1.08	.....	.....	
199,880	38,000	2.50	2.12	.....	Stretching still in progress when load was reduced.
5,260	1,000	0.	.....	.....	
26,300	5,000	.0413	.....	.....	
52,600	10,000	.0901	.....	.....	
78,900	15,000	.1384	.....	.....	
105,200	20,000	.1880	.....	.....	
131,500	25,000	.2390	.....	.....	
157,800	30,000	.2920	.0018	.....	
Rested under zero load 39 hours.					
5,260	1,000	0.	.....	.....	Micrometer reset.
26,300	5,000	.0415	.....	.....	
52,600	10,000	.0905	.....	.....	
78,900	15,000	.1385	.....	.....	
105,200	20,000	.1870	.....	.....	
131,500	25,000	.2380	.....	.....	
157,800	30,000	.2910	.0042	.....	
5,260	1,000	0.	.....	.....	Micrometer reset.
26,300	5,000	.0422	.....	.....	
52,600	10,000	.0905	.....	.....	
78,900	15,000	.1381	.....	.....	
105,200	20,000	.1870	.0008	.....	
Rested 40 hours under zero load.					
199,880	38,000	{ 2.59 2.60	.....	.....	(After 5 minutes.)
205,140	39,000	2.68	.....	.....	
210,400	40,000	2.88	.....	.....	
215,660	41,000	3.26	.....	3.85	
220,920	42,000	.....	.....	4.09	
226,180	43,000	.....	.....	4.38	
231,440	44,000	.....	.....	4.83	
236,700	45,000	.....	.....	5.33	
241,960	46,000	.....	.....	5.72	
247,220	47,000	.....	.....	6.20	
252,480	48,000	.....	.....	6.68	
257,740	49,000	.....	.....	7.13	
263,000	50,000	.....	.....	7.68	

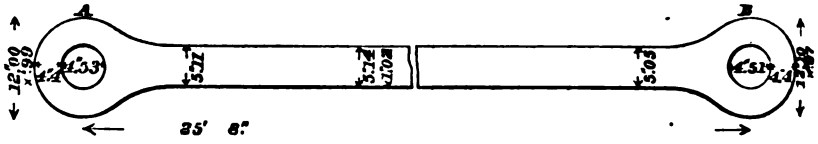
Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	
268, 260	51, 000	.....	.....	8. 26	
273, 520	52, 000	.....	.....	8. 87	
278, 780	53, 000	.....	.....	9. 54	
284, 040	54, 000	.....	.....	10. 23	
289, 300	55, 000	.....	.....	10. 94	
294, 560	56, 000	.....	.....	11. 67	
299, 820	57, 000	.....	.....	12. 42	
305, 080	58, 000	.....	.....	13. 40	
310, 340	59, 000	.....	.....	14. 38	
315, 600	60, 000	.....	.....	15. 43	
320, 860	61, 000	.....	.....	16. 62	
326, 120	62, 000	.....	.....	17. 95	
331, 380	63, 000	.....	.....	19. 60	
336, 640	64, 000	.....	.....	20. 82	
341, 200	64, 870	.....	.....	23. 75	Maximum load applied.
Test discontinued, the bar at the time yielding under the maximum load.					
0	0	19. 19	.....	.....	= 7.4 per cent.
0	0	.....	.....	22. 62	= 7.3 per cent.

Elongation of 10-inch sections, ".36, ".52, ".67, ".64, ".67, ".64, ".70, ".67, ".65, ".70, ".68, ".71, ".72, ".72, ".76, ".73, ".76, ".79, ".77, ".78, ".80, ".80, ".81, ".80, ".81, ".82, ".90, ".69.

Elongation of pin-holes, A ".40, B ".63.

Metal began to thin down at sides of pin-hole B.

No. 4135.



Sectional area of stem, 5.24 square inches.

Gauged length, 260".

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	
5, 240	1, 000	0.	0.	0.	Initial load.
26, 200	5, 000	.0471	.0059	.....	
52, 400	10, 000	.0959	.0081	.....	E = 27, 832, 000.
78, 600	15, 000	.1415	.0091	.....	E = 29, 147, 000.
104, 800	20, 000	.1860	.0100	.....	E = 29, 816, 000.
131, 000	25, 000	.2315	.0109	.....	E = 29, 147, 000.
157, 200	30, 000	.2780	.0130	.....	E = 29, 279, 000.
160, 000	.....	.2829	.....	.....	
162, 000	.....	.2870	.....	.....	
164, 000	.....	.2903	.....	.....	
166, 000	.....	.2940	.....	.....	
168, 000	.....	.2977	.....	.....	
170, 000	.....	.3014	.....	.....	
172, 000	.....	.3055	.....	.....	
174, 000	.....	.3090	.....	.....	
176, 000	.....	.3130	.....	.....	
178, 000	.....	.3171	.....	.....	
180, 000	.....	.3210	.....	.....	
182, 000	34, 730	.3260	.....	.....	Elastic limit.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
183, 400	35, 000	.3300	.0213	.....	
184, 000	.....	.3335	.....	.....	
186, 000	.....	.3390	.....	.....	
188, 640	36, 000	.3489	.....	.....	
193, 880	37, 000	.4140	.....	.....	
199, 120	38, 000	.8500	.....	.....	
204, 360	39, 000	2.14	.....	2.94	
209, 610	40, 000	.....	.....	3.10	
214, 840	41, 000	.....	.....	3.40	
220, 080	42, 000	.....	.....	3.75	
225, 320	43, 000	.....	.....	4.08	
230, 560	44, 000	.....	.....	4.46	
235, 800	45, 000	.....	.....	4.92	
241, 040	46, 000	.....	.....	5.40	
246, 280	47, 000	.....	.....	5.77	
251, 520	48, 000	.....	.....	6.23	
256, 760	49, 000	.....	.....	6.73	
262, 000	50, 000	.....	.....	7.25	
267, 240	51, 000	.....	.....	7.76	
272, 480	52, 000	.....	.....	8.31	
277, 720	53, 000	.....	.....	8.87	
282, 960	54, 000	.....	.....	9.50	
288, 200	55, 000	.....	.....	10.21	
293, 440	56, 000	.....	.....	10.90	
298, 680	57, 000	.....	.....	11.31	
303, 920	58, 000	.....	.....	12.31	
309, 160	59, 000	.....	.....	13.21	
314, 400	60, 000	.....	.....	14.21	
319, 640	61, 000	.....	.....	15.22	
324, 880	62, 000	.....	.....	16.28	
330, 120	63, 000	.....	.....	17.50	
335, 460	64, 000	.....	.....	18.86	
340, 700	65, 000	.....	.....	20.50	
343, 700	.....	.....	.....	21.54	
0	0	.....	.....	.....	Rested 5 minutes.
345, 200	.....	.....	.....	22.50	
345, 600	.....	.....	.....	22.90	
345, 940	66, 000	.....	.....	23.25	
346, 600	.....	.....	.....	23.65	
351, 180	67, 000	.....	.....	25.80	
363, 300	69, 330	.....	.....	32.70	Maximum load applied.
Test discontinued, stretching still going on without increase of load.					
0	0	27.10	.....	.....	=10.4 per cent.
0	0	.....	.....	31.60	=10.3 per cent.

Elongation of inch sections, ″.67, 1″.11, 1″.02, 1″.01, 1″, 1″.03, 1″.03, 1″.02, 1″.01; 1″.02, 1″.02, 1″.06, 1″.08, 1″.06, 1″.08, 1.″06, 1″.07. 1″.06, 1″.06, 1″.01, 1″.01, 1″.03, 1″.08, 1″.08, 1″.04, 1″.06, 1″.03, 1″.07, ″.94, ″.63.

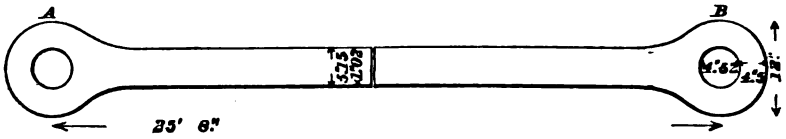
Elongation of pin-holes A ″.52, B ″.65.

After resting 8 days and 22 hours.
Gauged length, 287".10.
Sectional area called 4.747 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,240	1,104	0.	0.	0.	Initial load.
26,200	5,519	.0499	.0499	.....	
52,400	11,039	.1062	.0563	.....	
78,600	16,558	.1621	.0559	.....	
104,800	22,078	.2195	.0574	.....	
131,000	27,597	.2810	.0615	.....	
157,200	33,116	.3442	.0632	.....	
183,400	38,635	.4099	.0657	.....	
209,600	44,155	.4780	.0681	.....	
235,800	49,675	.5488	.0708	.....	
262,000	55,195	.6218	.0730	.....	
235,800	49,675	.5681	.0637	.....	
209,600	44,155	.5122	.0559	.....	
183,400	38,636	.4554	.0568	.....	
157,200	33,116	.3965	.0589	.....	
131,000	27,597	.3369	.0596	.....	
104,800	22,078	.2749	.0620	.....	
78,600	16,558	.2130	.0619	.....	
52,400	11,039	.1504	.0626	.....	
26,200	5,519	.0851	.0653	.....	
5,240	1,104	.0268	.0583	.....	
		.0255	.....	.....	After 5 minutes' rest.
26,200	5,519	.0737	.0482	.....	
52,400	10,039	.1301	.0564	.....	
78,600	16,558	.1870	.0569	.....	
104,800	22,078	.2451	.0581	.....	
131,000	27,597	.3052	.0601	.....	
157,200	33,116	.3673	.0621	.....	
183,400	38,636	.4300	.0627	.....	
209,600	44,155	.4940	.0640	.....	
235,800	49,675	.5587	.0647	.....	
262,000	55,194	.6251	.0664	.....	
		.6281	.....	.....	After 3 minutes' rest.
235,800	49,675	.5731	.0450	.....	
262,000	55,194	.6290	.0559	.....	
235,800	49,675	.5745	.0545	.....	
262,000	55,194	.6300	.0555	.....	
235,800	49,675	.5751	.0549	.....	
209,600	44,155	.5190	.0561	.....	
183,400	38,636	.4619	.0571	.....	
209,600	44,155	.5169	.0550	.....	
235,800	49,675	.5728	.0559	.....	
262,000	55,194	.6302	.0574	.....	
Load released to about 10,000 pounds per square inch, then applied again; time consumed 30 seconds.					
209,600	44,155	.5038	.....	.....	
235,800	49,675	.5661	.0623	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
262,000	55,194	.6297	.0636	.....	
235,800	49,675	.5750	.0547	.....	
262,000	55,194	.6304	.0554	.....	
235,800	49,675	.5751	.0553	.....	
209,600	44,155	.5192	.0559	.....	
183,400	38,636	.4626	.0566	.....	
157,200	33,116	.4032	.0594	.....	
183,400	38,636	.4580	.0548	.....	
209,600	44,155	.5139	.0559	.....	
235,800	49,675	.5717	.0578	.....	
262,000	55,194	.6306	.0589	.....	
235,800	49,675	.5760	.0546	.....	
209,600	44,155	.5200	.0560	.....	
183,400	38,636	.4636	.0564	.....	
157,200	33,116	.4047	.0589	.....	
131,000	27,597	.3447	.0600	.....	
157,200	33,116	.3985	.0538	.....	
183,400	38,636	.4551	.0566	.....	
209,600	44,155	.5126	.0575	.....	
235,800	49,675	.5711	.0585	.....	
262,000	55,194	.6311	.0600	.....	
235,800	49,675	.5761	.0550	.....	
262,000	55,194	.6319	.0558	.....	
235,800	49,675	.5771	.0548	.....	
209,600	44,155	.5210	.0561	.....	
183,400	38,636	.4640	.0570	.....	
157,200	33,116	.4044	.0596	.....	
131,000	27,597	.3460	.0584	.....	
104,800	22,078	.2842	.0618	.....	
78,600	16,558	.2211	.0631	.....	
52,400	11,039	.1589	.0622	.....	
26,200	5,519	.0915	.0674	.....	
5,240	1,104	.0389	.0526	.....	
26,200	5,519	.0838	.0449	.....	
52,400	11,039	.1399	.0561	.....	
78,600	5,519	.1972	.0573	.....	
104,800	22,078	.2550	.0578	.....	
131,000	27,597	.3157	.0607	.....	
157,200	33,116	.3769	.0612	.....	
183,400	38,636	.4397	.0628	.....	
209,600	44,155	.5017	.0620	.....	
235,800	49,675	.5651	.0634	.....	
262,000	55,194	.6300	.0649	.....	
5,240	1,104	.0358	.5942	.....	

No. 4136.



Sectional area of stem, 5.25 square inches.
Gauged length, 260″.
Pin-holes, ″.22 out of center line of stem.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,250	1,000	0.	0.	0.	Initial load.
26,250	5,000	.0456	.0065	.....	
52,500	10,000	.0915	.0085	.....	E = 29,612,000.
78,750	15,000	.1369	.0089	.....	E = 28,888,000.
105,000	20,000	.1815	.0096	.....	E = 29,682,000.
131,250	25,000	.2264	.0101	.....	E = 29,279,000.
157,500	30,000	.2720	.0109	.....	E = 29,017,000
170,000	.....	.2945	.....	.....	
172,000	.....	.2985	.....	.....	
174,000	.....	.3019	.....	.....	
176,000	.....	.3055	.....	.....	
178,000	.....	.3090	.....	.....	
180,000	.....	.3130	.....	.....	
182,000	.....	.3166	.....	.....	
183,750	.....	.3194	.0147	.....	E = 29,816,000.
186,000	.....	.3240	.....	.....	
188,000	.....	.3280	.....	.....	
190,000	.....	.3316	.....	.....	
192,000	.....	.3354	.....	.....	
194,000	.....	.3405	.....	.....	
196,000	37,330	.3459	.....	.....	Elastic limit.
198,000	.....	.3700	.....	.....	
200,000	.....	.5665	.....	.....	
204,750	39,000	1.07	.....	.....	
210,000	40,000	2.35	.....	2.76	
215,250	41,000	.....	.....	3.30	
220,500	42,000	.....	.....	3.61	
225,750	43,000	.....	.....	4.02	
231,000	44,000	.....	.....	4.44	
236,250	45,000	.....	.....	4.86	
241,500	46,000	.....	.....	5.30	
246,750	47,000	.....	.....	5.74	
252,000	48,000	.....	.....	6.18	
257,250	49,000	.....	.....	6.67	
262,500	50,000	.....	.....	7.15	
267,750	51,000	.....	.....	7.65	
273,000	52,000	.....	.....	8.20	
278,250	53,000	.....	.....	8.78	
283,500	54,000	.....	.....	9.42	
288,750	55,000	.....	.....	10.05	
294,000	56,000	.....	.....	10.70	
299,250	57,000	.....	.....	11.41	
304,500	58,000	.....	.....	12.17	
309,750	59,000	.....	.....	13.07	
315,000	60,000	.....	.....	13.90	
320,250	61,000	.....	.....	14.83	
325,500	62,000	.....	.....	15.80	
330,750	63,000	.....	.....	17.00	
336,000	64,000	.....	.....	18.35	
341,250	65,000	.....	.....	19.83	
345,200	.....	.....	.....	21.05	
0	0	.....	.....	.....	Rested 5 minutes.
346,500	.....	.....	.....	21.35	
351,750	.....	.....	.....	23.70	
357,000	.....	.....	.....	26.05	
361,400	.....	.....	.....	28.80	
362,000	.....	.....	.....	29.30	
362,250	.....	.....	.....	29.70	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
364,000	.....	.....	.....	30.70	
365,400	.....	.....	.....	31.90	
366,000	.....	.....	.....	32.80	
366,100	.....	.....	.....	33.00	
366,400	.....	.....	.....	33.60	
367,300	.....	.....	.....	34.20 34.40	
367,500	.....	.....	.....	34.80 35.00	
367,700	.....	.....	.....	35.65	
368,800	.....	.....	.....	36.20	
369,000	70,286	.....	.....	36.60	Maximum load reached.
0	0	30.42	.....	.....	=11.7 per cent.
0	0	.....	.....	35.48	=11.5 per cent.

Elongation of 10-inch sections, ″.57, 1″.16, 1″.22, 1″.18, 1″.19, 1″.18, 1″.16, 1″.20, 1″.13, 1″.17, 1″.13, 1″.17, 1″.23, 1″.19, 1″.17, 1″.16, 1″.20, 1″.17, 1″.17, 1″.14, 1″.13, 1″.20, 1″.11, 1″.17, 1″.17, 1″.15, 1″.17, 1″.16, 1″.26, ″.88.

Elongation of pin-holes, A ″.51, B ″.66.

Elongations now measured in 290″.42.

Sectional area called 4.70 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,500	1,117	0.	0.	0.	Micrometer reset.
26,250	5,585	.0495	.....	.....	
52,500	11,170	.1087	.....	.....	
78,750	16,755	.1682	.....	.....	
105,000	22,340	.2294	.....	.....	
131,250	27,925	.2923	.....	.....	
157,500	33,510	.3577	.....	.....	
183,750	39,095	.4236	.....	.....	
210,000	44,680	.4908	.....	.....	
236,250	50,265	.5595	.....	.....	
262,500	55,850	.6310	—.0010	.....	
10,000	.....	.....	.....	.....	Rested 1 hour.
5,250	1,117	.....	—.0150	.....	
5,250	1,117	0.	0.	0.	Micrometer reset.
26,250	5,585	.0500	.....	.....	
52,500	11,170	.1090	.....	.....	
78,750	16,755	.1675	.....	.....	
105,000	22,340	.2292	.....	.....	
131,250	27,925	.2926	.....	.....	
157,500	33,510	.3570	.....	.....	
183,750	39,095	.4227	.....	.....	
210,000	44,680	.4894	.....	.....	
236,250	50,265	.5566	.....	.....	
			.0028	.....	Immediate set.
262,500	55,850	.6263	.0005	.....	Set after 10 minutes.
			.0000	.....	Set after 12 minutes.

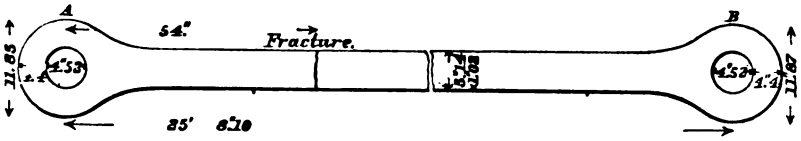
Applied loads.		In ganged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
26, 250	5, 585	.0503	.0503	.....	Immediate elongation.
		.0504	.....	.....	After 3 minutes.
52, 500	11, 170	.1093	.0590	.....	
		.0999	.....	.....	Do.
78, 750	16, 755	.1685	.0592	.....	
		.1690	.....	.....	Do.
105, 000	22, 340	.2299	.0614	.....	
		.2309	.....	.....	Do.
131, 250	27, 925	.2922	.0623	.....	
		.2935	.....	.....	Do.
157, 500	33, 510	.3562	.0640	.....	
		.3575	.....	.....	Do.
183, 750	39, 095	.4209	.0647	.....	
		.4222	.....	.....	Do.
210, 000	44, 680	.4868	.0659	.....	
		.4885	.....	.....	Do.
236, 250	50, 265	.5533	.0665	.....	
		.5549	.....	.....	Do.
262, 500	55, 850	.6209	.0676	.....	
		.6230	.....	.....	Do.
236, 250	50, 265	.5660	.0549	.....	Immediate recovery.
		.5650	.....	.....	After 3 minutes.
210, 000	44, 680	.5082	.0578	.....	
		.5080	.....	.....	Do.
183, 750	39, 095	.4491	.0591	.....	
		.4489	.....	.....	Do.
157, 500	33, 510	.3886	.0605	.....	
		.3880	.....	.....	Do.
131, 250	27, 925	.3262	.0624	.....	
		.3252	.....	.....	Do.
105, 000	22, 340	.2631	.0631	.....	
		.2620	.....	.....	Do.
78, 750	16, 755	.1980	.0651	.....	
		.1971	.....	.....	Do.
52, 500	11, 170	.1331	.0649	.....	
		.1319	.....	.....	Do.
26, 250	5, 585	.0655	0. 676	.....	
		.0627	.....	.....	Do.
5, 250	1, 117	.0048	0. 607	.....	
		.0030	.....	.....	Do.
Bar rested under initial load 15 hours.					
5, 250	.....	−.0054	.....	.....	Set found after resting, *i. e.*, total recovery = ″.0018 + ″.0054 = ″.0072.
5, 250	1, 117	0.	.....	.....	Micrometer reset.
26, 250	5, 585	.0504	.0504	.....	
52, 500	11, 170	.1084	.0580	.....	
78, 750	16, 755	.1660	.0576	.....	
105, 000	22, 340	.2250	.0590	.....	
131, 250	27, 925	.2870	.0620	.....	
157, 500	33, 510	.3510	.0640	.....	

Applied loads.		In ganged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
183, 750	39, 095	.4157	.0647	.....	
210, 000	44, 680	.4839	.0682	.....	
236, 250	50, 265	.5493	.0654	.....	
262, 500	55, 850	.6180	.0687	.....	
236, 250	50, 265	.5621	.0559	.....	
210, 000	44, 680	.5047	.0574	.....	
183, 750	39, 095	.4459	.0588	.....	
157, 500	33, 510	.3857	.0602	.....	
131, 250	27, 925	.3241	.0616	.....	
105, 000	22, 340	.2609	.0632	.....	
78, 750	16, 755	.1970	.0639	.....	
52, 500	11, 170	.1321	.0649	.....	
26, 250	5, 585	.0644	.0677	.....	
5, 250	1, 117	.0065	.0579	.....	Test discontinued.
After a further rest of 25 hours the bar placed in the testing-machine and loaded as follows:					
5, 250	1, 117	0.	.....	.....	Initial load.
26, 250	5, 585	.0501	.0501	.....	
52, 500	11, 170	.1080	.0579	.....	
78, 750	16, 755	.1652	.0572	.....	
105, 000	22, 340	.2246	.0594	.....	
131, 250	27, 925	.2861	.0615	.....	
157, 500	33, 510	.3504	.0643	.....	
183, 750	39, 095	.4151	.0647	.....	
210, 000	44, 680	.4821	.0670	.....	
236, 250	50, 265	.5499	.0678	.....	
262, 500	55, 850	.6191	.0692	.....	
236, 250	50, 265	.5641	.0550	.....	
210, 000	44, 680	.5067	.0574	.....	
183, 750	39, 095	.4481	.0586	.....	
157, 500	33, 510	.3881	.0600	.....	
131, 250	27, 925	.3266	.0615	.....	
105, 000	22, 340	.2634	.0632	.....	
78, 750	16, 755	.2000	.0634	.....	
52, 500	11, 170	.1364	.0636	.....	
26, 250	5, 585	.0696	.0668	.....	
5, 250	1, 117	.0119	.0577	.....	
262, 500	55, 850	.6205	.6086	.....	
5, 250	1, 117	.0130	.6075	.....	Test discontinued.
After a further rest of 24 hours and 20 minutes the bar again placed in the testing-machine and loaded as follows (total rest intervening from time of first straining, 64 hours and 20 minutes):					
5, 250	1, 117	0.	.....	.....	Initial load.
26, 250	5, 585	.0522	.0522	.....	
52, 500	11, 170	.1105	.0583	.....	
78, 750	16, 755	.1686	.0581	.....	
105, 000	22, 340	.2280	.0594	.....	
131, 250	27, 925	.2894	.0614	.....	
157, 500	33, 510	.3523	.0629	.....	
183, 750	39, 095	.4175	.0652	.....	
210, 000	44, 680	.4843	.0668	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
236, 250	50, 265	.5522	.0679	.....	
262, 500	55, 850	.6205	.0683	.....	
236, 250	50, 265	.5647	.0558	.....	
210, 000	44, 680	.5078	.0569	.....	
183, 750	39, 095	.4489	.0589	.....	
157, 500	33, 510	.3888	.0601	.....	
131, 250	27, 925	.3283	.0605	.....	
105, 000	22, 340	.2654	.0029	.....	
78, 750	16, 755	.2024	.0630	.....	
52, 500	11, 170	.1391	.0633	.....	
26, 250	5, 585	.0712	.0679	.....	
5, 250	1, 117	.0134	.0578	.....	
262, 500	55, 850	.6227	.6093	.....	
5, 250	1, 117	.0127	.6100	.....	
262, 500	55, 850	.6245	.6118	.....	
5, 250	1, 117	.0135	.6110	.....	
262, 500	55, 850	.6245	.6110	.....	
5, 250	1, 117	.0142	.6103	.....	Test discontinued.
After a further rest of 73 hours the bar again placed in the testing-machine and loaded as follows (total rest intervening from time of first straining 97 hours 20 minutes):					
5, 250	1, 117	0.	.....	.....	Initial load.
262, 250	5, 585	.0500	.0500	.....	
52, 500	11, 170	.1079	.0579	.....	
78, 750	16, 755	.1642	.0563	.....	
105, 000	22, 340	.2211	.0569	.....	
131, 250	27, 925	.2792	.0581	.....	
157, 500	33, 510	.3401	.0609	.....	
183, 750	39, 095	.4033	.0632	.....	
210, 000	44, 680	.4680	.0647	.....	
236, 250	50, 265	.5350	.0670	.....	
262, 500	55, 850	.6039	.0689	.....	
		.6062	.0023	.....	After 3 minutes' rest.
236, 250	50, 265	.5502	.0560	.....	
210, 000	44, 680	.4935	.0567	.....	
183, 750	39, 095	.4352	.0583	.....	
157, 500	33, 510	.3755	.0597	.....	
131, 250	27, 925	.3154	.0601	.....	
105, 000	22, 340	.2538	.0616	.....	
78, 750	16, 755	.1919	.0619	.....	
52, 500	11, 170	.1301	.0618	.....	
26, 250	5, 585	.0642	.0659	.....	
5, 250	1, 117	.0080	.0562	.....	
262, 500	55, 850	.6079	.5999	.....	
5, 250	1, 117	.0079	.6000	.....	
262, 500	55, 850	.6079	.6000	.....	
5, 250	1, 117	.0086	.5993	.....	Test discontinued.
After a further rest of 29 days bar again placed in the testing-machine and loaded as follows:					
5, 250	1, 117	0.	.....	.....	Initial load.
26, 250	5, 585	.0526	.0526	.....	
52, 500	11, 170	.1112	.0586	.....	E=27, 679, 000.
78, 750	16, 755	.1675	.0563	.....	E=28, 809, 000.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
105,000	22,340	.2237	.0562	.....	E=28,861,000.
131,250	27,925	.2800	.0563	.....	E=28,809,000.
157,500	33,510	.3365	.0565	.....	E=28,707,000.
183,750	39,095	.3935	.0570	.....	E=28,456,000.
210,000	44,680	.4520	.0585	.....	E=27,726,000. Slow yielding under stress. Carried this load 3 minutes.
236,250	50,265	.5084	.0564	.....	E=28,758,000.
262,500	55,850	.5673	.0589	.....	E=27,538,000.
		.5695	.0022	.....	After 3 minutes' rest.
236,250	50,265	.5140	.0555	.....	E=29,225,000.
210,000	44,680	.4583	.0557	.....	E=29,120,000.
183,750	39,095	.4021	.0562	.....	E=28,861,000.
157,500	33,510	.3460	.0561	.....	E=28,912,000.
131,250	27,925	.2895	.0565	.....	E=28,707,000.
105,000	22,340	.2327	.0568	.....	E=28,556,000.
78,750	16,755	.1753	.0574	.....	E=28,257,000.
52,500	11,170	.1188	.0565	.....	E=28,707,000.
26,250	5,585	.0602	.0586	.....	E=27,679,000.
5,250	1,117	.0081	.0521	.....	
		.0067	.0014	.....	After 5 minutes' rest.
26,250	5,585	.0569	.0502	.....	
52,500	11,170	.1147	.0578	.....	E=28,002,000.
78,750	16,755	.1710	.0563	.....	E=28,809,000.
105,000	22,340	.2274	.0564	.....	E=28,758,000.
131,250	27,925	.2839	.0565	.....	E=28,707,000.
157,500	33,510	.3408	.0569	.....	E=28,506,000.
183,750	39,095	.3980	.0572	.....	E=28,355,000.
210,000	44,680	.4550	.0570	.....	E=28,450,000.
183,750	39,095	.3997	.0553	.....	E=29,330,000.
157,500	33,510	.3439	.0558	.....	E=29,067,000.
131,250	27,925	.2876	.0563	.....	E=28,800,000.
105,000	22,340	.2315	.0561	.....	E=28,912,000.
78,750	16,755	.1749	.0566	.....	E=28,657,000.
52,500	11,170	.1183	.0566	.....	E=28,657,000.
26,250	5,585	.0598	.0585	.....	E=27,726,000.
5,250	1,117	.0083	.0515	.....	

No. 4137.



Sectional area of stem, 5.24 square inches.
Gauged length, 260″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,240	1,000	0.	0.	0.	Initial load.
26,200	5,000	.0410	.0010	.....	
52,400	10,000	.0878	.....	.....	
26,200	5,000	.0425	.0017	.....	
78,600	15,000	.1330	.....	.....	
52,400	10,000	.0888	.....	.....	
26,200	5,000	.0433	.0021	.....	
104,800	20,000	.1780	.....	.....	
78,600	15,000	.1340	.....	.....	
52,400	10,000	.0895	.....	.....	
26,200	5,000	.0439	.0029	.....	
131,000	25,000	.2230	.....	.....	
104,800	20,000	.1790	.....	.....	
78,600	15,000	.1348	.....	.....	
52,400	10,000	.0904	.....	.....	
26,200	5,000	.0443	.0035	.....	
157,200	30,000	.2710	.....	.....	
131,000	25,000	.2269	.....	.....	
104,800	20,000	.1830	.....	.....	
78,600	15,000	.1389	.....	.....	
52,400	10,000	.0942	.....	.....	
26,200	5,000	.0479	.0069	.....	
172,000	.....	.2949	.....	.....	
174,000	.....	.3032	.....	.....	
176,000	.....	.3076	.....	.....	
178,000	.....	.3118	.....	.....	
180,000	.....	.3169	.....	.....	
182,000	.....	.3225	.....	.....	
183,400	35,000	.3274	.....	.....	Elastic limit.
157,200	30,000	.2843	.....	.....	
131,000	25,000	.2403	.....	.....	
104,800	20,000	.1960	.....	.....	
78,600	15,000	.1518	.....	.....	
52,400	10,000	.1070	.....	.....	
26,200	5,000	.0608	.0189	.....	
186,000	35,500	.3375 .3400	.....	.....	
188,000	.....	.3685	.....	.....	
190,000	.....	.4285	.....	.....	
192,000	.....	.5800	.....	.....	
193,880	37,000	.9480	.....	.....	
183,400	35,000	.9391	.....	.....	
157,200	30,000	.8945	.....	.....	
131,000	25,000	.8499	.....	.....	
104,800	20,000	.8032	.....	.....	
78,600	15,000	.7569	.....	.....	
52,400	10,000	.7095	.....	.....	
26,200	5,000	.6597	.6140	.....	
.....	5,000	.6535	.....	.....	
52,400	10,000	.6998	.....	.....	
78,600	15,000	.7458	.....	.....	
104,800	20,000	.7913	.....	.....	
131,000	25,000	.8381	.....	.....	
157,200	30,000	.8856	.....	.....	
183,400	35,000	.9377	.6182	.....	
199,120	38,000	2.07	.....	.....	
204,360	39,000	2.32	.....	.....	
209,600	40,000	2.73	.....	3.31	
183,400	35,000	.4815	.....	.....	Micrometer reset. Special readings.
157,200	30,000	.4347	.....	.....	
131,000	25,000	.3863	.....	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
104, 800	20, 000	.3350	.....	.....	
78, 600	15, 000	.2821	.....	.....	
52, 400	10, 000	.2283	.....	.....	
26, 200	5, 000	.1681	.1135	.....	
26, 200	5, 000	.1524	.1110	.....	
52, 400	10, 000	.1999	.....	.....	
78, 600	15, 000	.2470	.....	.....	
104, 800	20, 000	.2961	.....	.....	
131, 000	25, 000	.3479	.....	.....	
157, 200	30, 000	.4010	.....	.....	
183, 400	35, 000	.4588	.1173	.....	
183, 400	35, 000	.4583	.1183	.....	
214, 840	41, 000	.....	.....	3.45	
220, 080	42, 000	.....	.....	3.80	
225, 320	43, 000	.....	.....	4.25	
230, 560	44, 000	.....	.....	4.66	
235 800	45, 000	.....	.....	5.05	
241, 040	46, 000	.....	.....	5.53	
246, 280	47, 000	.....	.....	6.02	
251, 520	48, 000	.....	.....	6.40	
256, 760	49, 000	.....	.....	6.85	
262, 000	50, 000	.....	.....	7.36	
267, 240	51, 000	.....	.....	7.87	
272, 480	52, 000	.....	.....	8.53	
277, 720	53, 000	.....	.....	9.04	
282, 960	54, 000	.....	.....	9.64	
288, 200	55, 000	.....	.....	10.30	
293, 440	56, 000	.....	.....	11.10	
298, 680	57, 000	.....	.....	11.75	
303, 920	58, 000	.....	.....	12.57	
309, 160	59, 000	.....	.....	13.50	
314, 400	60, 000	.....	.....	14.40	
319, 640	61, 000	.....	.....	15.50	
324, 880	62, 000	.....	.....	16.55	
330, 120	63, 000	.....	.....	17.70	
335, 360	64, 000	.....	.....	19.00	
340, 600	65, 000	.....	.....	20.67	
343, 700	.....	.....	.....	21.70	
0	0	.....	.....	.....	Rested 12 minutes.
345, 840	66, 000	.....	.....	22.40	
351, 080	67, 000	.....	.....	25.00	
356, 320	68, 000	.....	.....	27.30	
361, 560	69, 000	.....	.....	30.70	
366, 800	70, 000	.....	.....	35.20	
368, 000	70, 229	.....	.....	36.80	Tensile strength.
0	0	30.15	.....	.....	=11.6 per cent.
0	0	.....	.....	34.98	=11.4 per cent.

Elongation of 10-inch sections, ″.76, 1″.22, 1″.27, 1″.21, 1″.26,* 1″.20, 1.″19, 1″.22, 1″.17, 1.″24, 1″.20, 1″.15, 1″.19, 1″.20, 1″.15, 1″.20, 1″.13, 1″.13, 1″.18, 1″.10, 1″.12, 1″.05, 1″.06, 1″.10, 1″.09, 1″.11, 1″.04, 1″ 13, ″.75.

Elongation of pin-holes, A ″.55, B ″.50.

Area at fracture, 4″.83 × ″.94 = 4.54 square inches.

Contraction, 13.4 per cent.

Fractured 4½ feet from center of pin-hole A.

Appearance, granular, radiating from a button of hard metal about ½″ diameter, which was rolled into the surface of the bar.

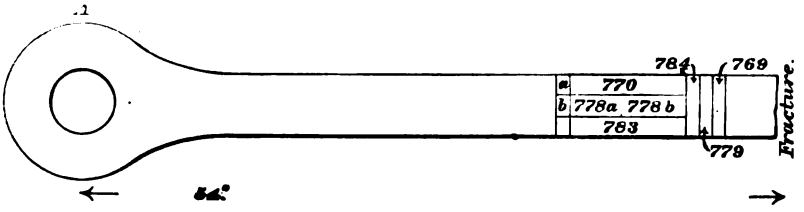
· a rest of 5 days and 18 hours, fractured end B again placed in
chine.
ed length, 233″.41, beginning near the fractured end and termi-
at the same point at end B as the original gauged length.
onal area called 4.695 square inches.

lied loads.	In gauged length.		Elongation (center to center of pins).	Remarks.
Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	
1,116	0.	0.	0.	Initial load.
5,580	.0383	.0383	.....	
11,160	.0842	.0459	.....	
16,740	.1306	.0464	.....	
22,319	.1792	.0486	.....	
27,899	.2330	.0538	.....	
33,479	.2902	.0572	.....	
39,059	.3530	.0628	.....	
33,479	.3090	.0440	.....	
27,899	.2631	.0459	.....	
22,319	.2159	.0472	.....	
16,740	.1670	.0489	.....	
11,160	.1180	.0490	.....	
5,580	.0671	.0509	.....	
1,116	.0259	.0412	.....	
5,580	.0621	.0362	.....	
11,160	.1080	.0459	.....	
16,740	.1546	.0466	.....	
22,319	.2030	.0484	.....	
27,899	.2531	.0501	.....	
33,479	.3037	.0506	.....	
39,059	.3569	.0532	.....	
44,638	.4200	.0631	.....	
50,218	.4939	.0739	.....	
5,580	.5765	.0826	.....	
50,218	.5320	.0445	.....	
44,638	.4850	.0470	.....	
39,059	.4371	.0479	.....	
33,479	.3876	.0495	.....	
27,899	.3378	.0498	.....	
22,319	.2860	.0518	.....	
16,740	.2330	.0530	.....	
11,160	.1810	.0520	.....	
5,580	.1272	.0538	.....	
1,116	.0810	.0462	.....	
	.0746	.0064	.....	After resting 1 hour.
5,580	.1121	.0375	.....	
11,160	.1581	.0460	.....	
16,740	.2060	.0479	.....	
22,319	.2541	.0481	.....	
27,899	.3050	.0509	.....	
33,479	.3568	.0518	.....	
39,059	.4089	.0521	.....	
44,638	.4623	.0534	.....	
50,218	.5169	.0546	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
		.5778	.0609	.....	
262, 000	55, 798	.5806	.0028	.....	
		.5830	.0024	.....	
235, 800	50, 218	.5374	.0456	.....	
209, 600	44, 638	.4908	.0466	.....	
235, 800	50, 218	.5368	.0460	.....	
262, 000	55, 798	.5836	.0468	.....	
235, 800	50, 218	.5381	.0445	.....	
209, 600	44, 638	.4917	.0464	.....	
188, 400	39, 059	.4441	.0476	.....	
157, 200	33, 478	.3947	.0494	.....	
183, 400	39, 059	.4404	.0457	.....	
209, 600	44, 638	.4870	.0466	.....	
235, 800	50, 218	.5350	.0480	.....	
262, 000	55, 798	.5844	.0494	.....	
5, 240	1, 116	.0900	.4944	.....	
157, 200	33, 479	.3710	.2810	.....	
183, 400	39, 059	.4230	.0520	.....	
209, 600	44, 638	.4759	.0529	.....	
235, 800	50, 218	.5295	.0536	.....	
262, 000	55, 798	.5850	.0555	.....	
235, 800	50, 218	.5400	.0450	.....	
209, 600	44, 638	.4931	.0469	.....	
183, 400	39, 059	.4459	.0472	.....	
157, 200	33, 479	.3960	.0499	.....	
131, 000	27, 899	.3468	.0492	.....	
104, 000	22, 319	.2947	.0521	.....	
78, 600	16, 739	.2429	.0518	.....	
52, 400	11, 160	.1921	.0508	.....	
26, 200	5, 580	.1370	.0551	.....	
5, 240	1, 116	.0937	.0433	.....	
26, 200	5, 580	.1300	.0363	.....	
262, 000	55, 798	.5860	.4560	.....	
26, 200	5, 580	.1367	.4503	.....	
262, 000	55, 798	.5869	.4502	.....	
26, 200	5, 580	.1389	.4480	.....	
262, 000	55, 798	.5879	.4490	.....	
26, 200	5, 580	.1893	.3986	.....	
262, 000	55, 798	.5887	.3994	.....	
26, 200	5, 580	.1400	.4487	.....	
5, 240	1, 116	.0970	.0430	.....	

Samples taken from steel eye-bar No. 4137 one month and seven days after the original test of the eye-bar.

[Sketch showing positions from whence specimens were taken from the shorter fractured end.]



No. 769, compression specimen.
No. 770, compression specimen.
No. 778*a*, compression specimen, annealed.
No. 778*b*, compression specimen, not annealed.
No. 779, compression specimen, annealed.
No. 783, tension specimen.
No. 784, tension specimen.
(*a* and *b*, specific gravity specimens.)

No. 769.

Compression test.

Crosswise specimen.
Total length, 4″.75.
Diameter, ″.900.
Sectional area, .636 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
636	1,000	0.	0.	Initial load.
3,180	5,000	.0006	0.	
6,360	10,000	.0011	0.	
9,540	15,000	.0016	0.	
12,720	20,000	.0022	0.	
15,900	25,000	.0027	0.	
19,080	30,000	.0032	0.	
22,260	35,000	.0037	0.	
25,440	40,000	.0043	.0001	
28,620	45,000	.0048	.0002	
31,800	50,000	.0055	.0004	
34,980	55,000	.0062	.0006	
38,160	60,000	.0070	.0009	
41,340	65,000	.0080	.0014	
41,976	66,000	.0082	.....	
42,612	67,000	.0085	.....	
43,248	68,000	.0088	.....	
43,884	69,000	.0092	.....	
44,520	70,000	.0095	.0024	
45,156	71,000	.0099	.....	
45,792	72,000	.0103	.....	
46,428	73,000	.0107	.....	
47,064	74,000	.0115	.....	
47,700	75,000	.0122	.0045	
48,336	76,000	.0131	.....	
48,972	77,000	.0139	.....	
49,608	78,000	.0154	.....	
50,244	79,000	.0170	.....	
50,880	80,000	.0193	.0110	
51,516	81,000	.0222	.....	
52,152	82,000	.0260	.....	
52,788	83,000	.0309	.....	
53,424	84,000	.0364	.....	
55,800	87,735	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 770.

Compression test.

Lengthwise specimen.
Total length, 8″.90.
Diameter, ″.900.
Sectional area, .636 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
636	1,000	0.	0.	Initial load.
3,180	5,000	.0010	0.	
6,360	10,000	.0020	0.	
9,540	15,000	.0031	.0002	
12,720	20,000	.0043	.0003	
15,900	25,000	.0055	.0005	
19,080	30,000	.0070	.0012	
22,260	35,000	.0102	.0034	
25,440	40,000	.0160	.0081	
28,620	45,000	.0255	.0163	
31,800	50,000	.0376	.0261	
34,980	55,000	.0606	.0485	
35,616	56,000	.0685	.....	
36,252	57,000	.0797	.....	
36,888	58,000	.0975	.....	
38,200	60,062	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 778*a*.

Compression test.

Lengthwise specimen. Annealed end. Heated cherry red and cooled in open air.

Total length, 4″.43.
Diameter, ″.900.
Sectional area, .636 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
636	1,000	0.	0.	Initial load.
3,180	5,000	.0004	0.	
6,360	10,000	.0010	0.	
9,540	15,000	.0015	0.	
12,720	20,000	.0021	0.	
15,900	25,000	.0026	0.	
19,080	30,000	.0032	0.	
19,716	31,000	.0033	.....	
20,352	32,000	.0034	.....	
20,988	33,000	.0035	.....	
21,624	34,000	.0036	.....	
22,260	35,000	.0038	—.0001	
22,896	36,000	.0039	.....	
23,532	37,000	.0040	.....	
24,168	38,000	.0040	.....	
24,804	39,000	.0040	.....	
25,440	40,000	.0041	—.0001	
26,076	41,000	.0042	.....	
26,712	42,000	.0043	.....	
27,348	43,000	.0044	.....	
27,984	44,000	.0044	.....	
28,620	45,000	.0045	—.0002	
29,256	46,000	.0045	.....	Elastic limit.
29,892	47,000	.0116	.....	
30,528	48,000	.0278	.....	
31,164	49,000	.0333	.....	
31,800	50,000	.0410	.....	
53,900	84,748	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 778*b*.

Compression test.

Lengthwise specimen from unannealed end.
Total length, 4″.41.
Diameter, ″.900.
Sectional area, .636 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
636	1,000	0.	0.	Initial load.
3,180	5,000	.0005	0.	
6,360	10,000	.0011	0.	
9,540	15,000	.0016	0.	
12,720	20,000	.0021	0.	
15,900	25,000	.0028	0.	
19,080	30,000	.0035	.0003	
19,716	31,000	.0036	.....	
20,352	32,000	.0039	.....	
20,988	33,000	.0042	.....	
21,624	34,000	.0045	.....	
22,260	35,000	.0049	.0012	
22,896	36,000	.0053	.....	
23,532	37,000	.0056	.....	
24,168	38,000	.0061	.....	
24,804	39,000	.0068	.....	
25,440	40,000	.0074	.0022	
26,076	41,000	.0082	.....	
26,712	42,000	.0089	.....	
27,348	43,000	.0099	.....	
27,984	44,000	.0108	.....	
28,620	45,000	.0118	.0070	
29,256	46,000	.0125	.....	
29,892	47,000	.0136	.....	
30,528	48,000	.0148	.....	
31,164	49,000	.0160	.....	
31,800	50,000	.0175	.0122	
32,436	51,000	.0187	.....	
33,072	52,000	.0200	.....	
33,708	53,000	.0210	.....	
34,344	54,000	.0225	.....	
34,980	55,000	.0255	.0195	
35,616	56,000	.0270	.....	
36,252	57,000	.0290	.....	
36,888	58,000	.0308	.....	
37,524	59,000	.0325	.....	
38,160	60,000	.0358	.0290	
38,796	61,000	.0380	.....	
39,432	62,000	.0408	.....	
40,068	63,000	.0435	.....	
40,704	64,000	.0467	.....	
41,340	65,000	.0505	.0424	
41,976	66,000	.0540	.....	
42,612	67,000	.0576	.....	
43,248	68,000	.0611	.....	
43,884	69,000	.0670	.....	
44,520	70,000	.0728	.0651	
45,156	71,000	.0783	.....	
45,792	72,000	.0866	.....	
46,428	73,000	.0931	.....	
47,064	74,000	.1045	.....	
47,700	75,000	.1154	.....	
52,890	83,160	.....	.....	Ultimate strength.

Failed by triple flexure.
Maximum diameter at middle, after the test, ″.980.

No. 779.

Compression test.

Crosswise specimen.
Annealed. Heated cherry red and cooled in open air.
Total length, 4″.75.
Diameter, ″.899.
Sectional area .635 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
635	1,000	0.	0.	Initial load.
3,175	5,000	.0006	0.	
6,350	10,000	.0011	0.	
9,525	15,000	.0017	0.	
12,700	20,000	.0022	0.	
15,875	25,000	.0027	—.0001	
19,050	30,000	.0032	—.0001	
22,225	35,000	.0037	—.0001	
25,400	40,000	.0042	—.0001	
26,035	41,000	.0042	.....	
26,670	42,000	.0043	.....	
27,305	43,000	.0044	.....	
27,940	44,000	.0045	.....	
28,575	45,000	.0045	.....	
29,210	46,000	.0046	.....	
29,845	47,000	.0046	.....	
30,480	48,000	.0235	.....	
31,115	49,000	.0404	.....	
31,750	50,000	.0426	.0370	
32,385	51,000	.0443	.....	
33,020	52,000	.0449	.....	
33,655	53,000	.0499	.....	
34,290	54,000	.0530	.....	
34,925	55,000	.0589	.0527	
35,560	56,000	.0620	.....	
36,195	57,000	.0680	.....	
36,830	58,000	.0725	.....	
37,465	59,000	.0771	.....	
38,100	60,000	.0806	.0740	
38,735	61,000	.0836	.....	
39,370	62,000	.0885	.....	
40,005	63,000	.0925	.....	
40,640	64,000	.0961	.....	
41,275	65,000	.1002	.0980	
51,500	81,102	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 783.

Tension test.

Lengthwise specimen.
Total length, 9″.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0007	0.	
2,500	10,000	.0018	0.	
3,750	15,000	.0028	0.	
5,000	20,000	.0038	0.	
6,250	25,000	.0047	0.	
7,500	30,000	.0058	0.	
8,750	35,000	.0068	0.	
10,000	40,000	.0078	0.	
11,250	45,000	.0088	0.	
12,500	50,000	.0099	0.	
13,750	55,000	.0109	0.	
15,000	60,000	.0120	0.	
16,250	65,000	.0130	0.	
17,500	70,000	.0140	.....	
18,000	72,000	.0144	.....	
18,500	74,000	.0149	.....	
19,000	76,000	.0153	.....	
19,500	78,000	.0159	.....	
20,000	80,000	.0163	.....	
20,500	82,000	.0169	.....	
21,000	84,000	.0172	.....	
21,500	86,000	.0180	.....	
22,000	88,000	.0190	.....	
22,500	90,000	.0206	.....	
22,800	91,200	.....	.....	Tensile strength.

Elongation after fracture, ″.30 = 5.0 per cent.
Elongation of inch sections, ″.*27, ″.03, ″.00, ″.00, ″.00, ″.00.
Diameter at fracture, ″.42.
Area, .1385 square inch.
Contraction, 44.6 per cent.
Fractured $\frac{3}{4}$″ from neck.
Appearance, fine, silky

No. 784.

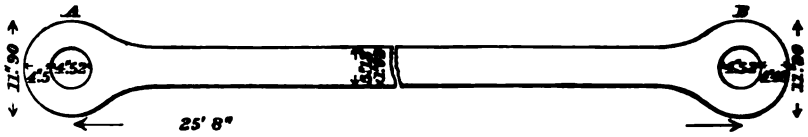
Tension test.

Crosswise specimen.
Total length, 4″.75.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004	0.	
2,500	10,000	.0009	0.	
3,750	15,000	.0014	0.	
5,000	20,000	.0020	0.	
6,250	25,000	.0025	0.	
7,500	30,000	.0031	.0001	
8,750	35,000	.0037	.0002	
10,000	40,000	.0045	.0005	
11,250	45,000	.0057	.0012	
12,500	50,000	.0072	.0021	
13,750	55,000	.0100	.0043	
14,000	56,000	.0106	.....	
14,250	57,000	.0110	.....	
14,500	58,000	.0118	.....	
14,750	59,000	.0125	.....	
15,000	60,000	.0137	.....	
15,250	61,000	.0148	.....	
15,500	62,000	.0158	.....	
15,750	63,000	.0170	.....	
16,000	64,000	.0191	.....	
16,250	65,000	.0206	.....	
16,500	66,000	.0226	.....	
16,750	67,000	.0246	.....	
17,000	68,000	.0276	.....	
17,250	69,000	.0302	.....	
17,500	70,000	.0337	.....	
17,750	71,000	.0368	.....	
18,000	72,000	.0411	.....	
18,250	73,000	.0437	.....	
19,000	76,000	.060	.....	
19,500	78,000	.085	.....	
20,000	80,000	.11	.....	
20,400	81,600	.21	.....	Tensile strength.
19,100	.....	.....	.....	Load at time of rupture.

Elongation after rupture, ″.36 = 6.0 per cent.
Elongation of inch sections, ″.*15, ″.13, ″.08.
Diameter at fracture, ″.47.
Area, .1735 square inch.
Contraction, 30.6 per cent.
Fractured, 1″.00 from neck.
Appearance, granular, 40 per cent.; silky, flaky, 60 per cent.

No. 4138.



Sectional area of stem, 5.23 square inches.
Gauged length, 260″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5, 230	1, 000	0.	0.	0.	Initial load.
26, 150	5, 000	.0413	0.	.....	
52, 300	10, 000	.0879	0.	.....	
78, 450	15, 000	.1324	0.	.....	
104, 600	20, 000	.1770	0.	.....	
130, 750	25, 000	.2228	.0004	.....	
156, 900	30, 000	.2705	.....	.....	
130, 750	25, 000	.2269	.....	.....	
104, 600	20, 000	.1833	.....	.....	
78, 450	15, 000	.1377	.....	.....	
52, 300	10, 000	.0930	.....	.....	
26, 150	5, 000	.0460	.0037	.....	
170, 000	.....	.2961	.....	.....	
172, 000	.....	.2987	.....	.....	
174, 000	.....	.3034	.....	.....	
176, 000	.....	.3069	.....	.....	
178, 000	.....	.3110	.....	.....	
180, 000	.....	.3149	.....	.....	
182, 000	.....	.3194	.....	.....	
183, 050	35, 000	.3231	.0096	.....	
184, 000	.....	.3269	.....	.....	
186, 000	.....	.3317	.....	.....	
188, 000	35, 950	.3379	.....	.....	Elastic limit.
190, 000	.....	.3510	.....	.....	
192, 000	.....	.3680	.....	.....	
193, 510	37, 000	.3920	.....	.....	
198, 740	38, 000	.6540	.....	.....	
203, 970	39, 000	1.60	.....	1.85	
209, 200	40, 000	.....	.....	2.25	
214, 430	41, 000	.....	.....	2.82	
219, 660	42, 000	.....	.....	3.20	
224, 890	43, 000	.....	.....	3.56	
230, 120	44, 000	.....	.....	3.99	
235, 350	45, 000	.....	.....	4.33	
240, 580	46, 000	.....	.....	4.72	
245, 810	47, 000	.....	.....	5.15	
251, 040	48, 000	.....	.....	5.36	
256, 270	49, 000	.....	.....	6.08	
261, 500	50, 000	.....	.....	6.50	
266, 730	51, 000	.....	.....	6.95	
271, 960	52, 000	.....	.....	7.42	
277, 190	53, 000	.....	.....	7.96	
282, 420	54, 000	.....	.....	8.51	
287, 650	55, 000	.....	.....	9.10	
292, 880	56, 000	.....	.....	9.68	
298, 110	57, 000	.....	.....	10.33	
303, 340	58, 000	.....	.....	11.01	
308, 570	59, 000	.....	.....	11.76	
313, 800	60, 000	.....	.....	12.60	
319, 030	61, 000	.....	.....	13.40	
324, 260	62, 000	.....	.....	14.28	
329, 490	63, 000	.....	.....	15.25	
334, 720	64, 000	.....	.....	16.40	
339, 950	65, 000	.....	.....	17.54	
345, 180	66, 000	.....	.....	18.90	
350, 410	67, 000	.....	.....	20.58	
353, 500	.....	.....	.....	21.65	
0	0	.....	.....	20.53	
355, 640	68, 000	.....	.....	22.50	
360, 870	69, 000	.....	.....	25.20	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
366, 100	70, 000	.....	.....	28. 40	
371, 330	71, 000	.....	.....	32. 30	
374, 900	71, 680	.....	.....	36. 60	Maximum load reached. Stretching still going on, and load slowly advancing.
0	0	30. 64	.....	.....	=11.8 per cent.
0	0	.....	.....	35. 38	=11.5 per cent.

Elongation of inch sections, ″.73, 1″.16, 1″.14, 1″.11, 1″.10, 1″12, 1″.12, 1″.09, 1″.10, 1″.13, 1″.14, 1″.15, 1″.19, 1″.20, 1″.19, 1″.21, 1″.23, 1″.22, 1″.18, 1″.22, 1″.14, 1″.17, 1″.24, 1″.26, 1″.24, 1″.28, 1″.27, ″.71.

Elongation of pin-holes, A ″.49, B ″51.

Area at middle of length of stem, 4″.84 × ″.94 = 4.55 square inches.

Contraction, 14.0 per cent.

No. 4139.

Sectional area of stem, 5.25 square inches.
Gauged length, 260″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5, 250	1, 000	0.	0.	0.	Initial load.
26, 250	5, 000	.0450	.0051	.....	
52, 500	10, 000	.0890	.0052	.....	E = 29, 612, 000.
78, 750	15, 000	.1332	.0060	.....	E = 29, 953, 000.
105, 000	20, 000	.1768	.0060	.....	E = 29, 816, 000.
131, 250	25, 000	.2222	.0083	.....	E = 30, 162, 000.
157, 500	30, 000	.2722	.....	.....	
131, 250	25, 000	.2280	.....	.....	
105, 000	20, 000	.1850	.....	.....	
78, 750	15, 000	.1413	.....	.....	
52, 500	10, 000	.0980	.....	.....	
26, 250	5, 000	.0530	.0136	.....	
170, 000	.....	.2970	.....	.....	
172, 000	.....	.3009	.....	.....	
174, 000	.....	.3049	.....	.....	
176, 000	.....	.3092	.....	.....	
178, 000	.....	.3149	.....	.....	
180, 000	.....	.3185	.....	.....	
182, 000	.....	.3240	.....	.....	
183, 750	35, 000	.3293	.....	.....	Elastic limit.
157, 500	30, 000	.2860	.....	.....	
131, 250	25, 000	.2427	.....	.....	
105, 000	20, 000	.1990	.....	.....	
78, 750	15, 000	.1550	.....	.....	
52, 500	10, 000	.1111	.....	.....	
26, 250	5, 000	.0662	.0268	.....	
186, 000	.....	.3371	.....	.....	
188, 000	.....	.3480	.....	.....	
190, 000	.....	.3594	.....	.....	
192, 000	.....	.3696	.....	.....	
194, 250	37, 000	.4602	.....	.....	
183, 750	.....	.4488	.....	.....	
157, 500	.....	.4050	.....	.....	
131, 250	.....	.3610	.....	.....	
105, 000	.....	.3163	.....	.....	
78, 750	.....	.2726	.....	.....	
52, 500	.....	.2281	.....	.....	
26, 250	.....	.1824	.....	.....	
5, 250	.....	.1418	.....	.....	
199, 500	38, 000	.9970	.....	.....	

Sectional area now called 5.237 square inches.

Applied loads.		In gauged length.		Elongation (center to to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
183, 750	35, 089	.9844	.0126	.....	
157, 500	30, 076	.9407	.0437	.....	E = 29, 899, 000.
131, 250	25, 064	.8960	.0447	.....	E = 29, 230, 000.
105, 000	20, 051	.8501	.0459	.....	E = 28, 466, 000.
78, 750	15, 038	.8031	.0470	.....	E = 27, 800, 000.
52, 500	10, 025	.7568	.0463	.....	E = 28, 220, 000.
26, 250	5, 013	.7067	.0501	.....	E = 26, 080, 000.
5, 250	1, 003	.6614	.0453	.....	
200, 000	.....	.....	.....	.....	This load applied and left on the bar 16 hours; in the mean time the load fell to 124,000 pounds on account of stretching of the bar and leakage of the hydraulic packings of the testing-machine.
5, 250	1, 003	.72	.....	.....	

Gauged length, 260.″72.
Sectional area called 5.235 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inch.*	
5, 250	1, 003	0.	0.	.....	Micrometer reset.
26, 250	5, 014	.0394	.0394	.....	
52, 500	10, 028	.0847	.0453	.....	E = 28, 856, 000.
78, 750	15, 042	.1298	.0451	.....	E = 28, 984, 000.
105, 000	20, 055	.1752	.0454	.....	E = 28, 793, 000.
131, 250	25, 069	.2211	.0459	.....	E = 28, 479, 000.
157, 500	30, 083	.2687	.0476	.....	E = 27, 462, 000.
183, 750	35, 097	.3175	.0488	.....	E = 26, 787, 000.
157, 500	30, 083	.2745	.0430	.....	E = 30, 400, 000.
131, 250	25, 069	.2300	.0445	.....	E = 29, 375, 000.
105, 000	20, 055	.1852	.0448	.....	E = 29, 188, 000.
78, 750	15, 042	.1400	.0452	.....	E = 28, 920, 000.
52, 500	10, 028	.0939	.0461	.....	E = 28, 355, 000.
26, 250	5, 014	.0432	.0507	.....	E = 25, 783, 000.
5, 250	1, 003	.0027	.0405	.....	
204, 750	39, 000	2.08	.....	.....	
210, 000	40, 000	2.73	.....	.....	

Gauged length, 262″.73.
Sectional area called 5.195 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inches.*	
5,250	1,010	0.	.....	.....	Micrometer reset.
26,250	5,052	.0409	.0409	.....	
52,500	10,105	.0878	.0469	.....	E = 28,303,000.
78,750	15,158	.1341	.0463	.....	E = 28,670,000.
105,000	20,210	.1833	.0492	.....	E = 26,980,000.
131,250	25,263	.2338	.0505	.....	E = 26,286,000.
157,500	30,315	.2867	.0529	.....	E = 25,093,000.
183,750	35,368	.3440	.0573	.....	E = 21,366,000.
157,500	30,315	.2992	.0448	.....	E = 29,630,000.
131,250	25,263	.2539	.0453	.....	E = 29,302,000.
105,000	20,210	.2068	.0471	.....	E = 28,183,000.
78,750	15,158	.1581	.0487	.....	E = 27,257,000.
52,500	10,105	.1083	.0498	.....	E = 26,655,000.
26,250	5,052	.0546	.0537	.....	E = 24,719,000.
5,250	1,010	.0071	.0475	.....	
215,250	41,000	.....	.....	3.50	
220,500	42,000	.....	.....	3.70	
225,750	43,000	.....	.....	3.93	
231,000	44,000	.....	.....	4.28	
236,250	45,000	.....	.....	4.75	
241,500	46,000	.....	.....	5.17	
246,750	47,000	.....	.....	5.68	
252,000	48,000	.....	.....	6.08	
257,250	49,000	.....	.....	6.50	
262,500	50,000	.....	.....	7.00	
267,750	51,000	.....	.....	7.49	
273,000	52,000	.....	.....	8.05	
278,250	53,000	.....	.....	8.60	
283,500	54,000	.....	.....	9.12	
288,750	55,000	.....	.....	9.70	
294,000	56,000	.....	.....	10.40	
299,250	57,000	.....	.....	11.00	
304,500	58,000	.....	.....	11.71	
309,750	59,000	.....	.....	12.45	
315,000	60,000	.....	.....	13.35	
320,250	61,000	.....	.....	14.32	
325,500	62,000	.....	.....	15.35	
330,750	63,000	.....	.....	16.48	
336,000	64,000	.....	.....	17.70	
341,250	65,000	.....	.....	19.10	
346,500	66,000	.....	.....	20.75	
348,500	.....	.....	.....	21.55	
0	0	.....	.....	20.50	
351,750	67,000	.....	.....	23.20	
357,000	68,000	.....	.....	24.90	
362,250	69,000	.....	.....	27.55	
367,500	70,000	.....	.....	31.60	
372,200	70,895	.....	.....	37.80	Maximum load.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inch.*	
5,250	1,000	.....	.....	36.53	
0	0	31.46	.....	.....	=12.1 per cent.
0	0	.....	.....	36.38	=11.8 per cent.

Elongation of 10-inch sections, ″.78, 1″.30, 1″.10, 1″.16, 1″.16, 1″.16, 1″.20, 1″.14, 1″.19, 1″.20, 1″.16, 1″.22, 1″.23, 1″.26, 1″.27, 1″.24, 1″.25, 1″.21, 1″.21, 1″.21, 1″.26, 1″.22, 1″.22, 1″.22, 1″.21, 1″.27, 1″.25, 1″.24, 1″.23, ″.77.

Elongation of pin-holes, A ″.42, B ″.54.

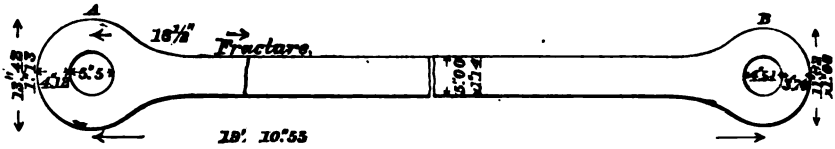
Gauged length, 291″.46.

Sectional area called 4.683 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,250	1,121	0.	.....	.....	Micrometer reset.
26,250	5,605	.0502	.0502	.....	
52,500	11,210	.1093	.0591	.....	E=27,641,000.
78,750	16,815	.1691	.0598	.....	E=27,318,000.
105,000	22,420	.2322	.0631	.....	E=25,889,000.
131,250	28,025	.2963	.0641	.....	E=25,485,000.
157,500	33,630	.3622	.0659	.....	E=24,789,000.
183,750	39,235	.4299	.0677	.....	E=24,130,000.
157,500	33,630	.3731	.0568	.....	E=28,761,000.
131,250	28,025	.3150	.0581	.....	E=28,127,000.
105,000	22,420	.2551	.0599	.....	E=27,272,000
78,750	16,815	.1930	.0621	.....	E=26,306,000.
52,500	11,210	.1305	.0625	.....	E=26,138,000.
26,250	5,605	.0636	.0669	.....	
5,250	1,121	.0077	.0559	.....	
26,250	5,605	.0550	.0473	.....	
52,500	11,210	.1141	.0591	.....	
78,750	16,815	.1739	.0598	.....	
105,000	22,420	.2353	.0614	.....	
131,250	28,025	.2981	.0628	.....	
157,500	33,630	.3640	.0659	.....	Rested under load 10 minutes.
183,750	39,235	.4270	.0630	.....	
210,000	45,014	.4930	.0660	.....	
236,250	50,448	.5640	.0710	.....	
262,500	56,053	.6380	.0740	.....	
236,250	50,448	.5802	.0578	.....	
210,000	45,014	.5219	.0583	.....	
183,750	39,235	.4621	.0598	.....	
157,500	33,630	.3993	.0628	.....	
131,250	28,025	.3373	.0620	.....	
105,000	22,420	.2730	.0643	.....	
78,750	16,815	.2060	.0670	.....	
52,500	11,210	.1428	.0632	.....	
26,250	5,605	.0719	.0709	.....	
5,250	1,121	.0123	.0596	.....	
262,500	56,053	.6364	.6241	.....	
5,250	1,121	.0130	.6234	.....	Test discontinued.

DETAILS OF TESTS OF WROUGHT-IRON EYE-BARS.

No. 763.



Sectional area of stem, 5.70 square inches.
Gauged length, 180″.
Twenty-two 10-inch sections laid off along stem.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	
5,700	1,000	0.	0.	0.	Initial load.
28,500	5,000	.0310	.0034	.....	
57,000	10,000	.0647	.0044	.....	E = 27,522,000.
85,500	15,000	.0995	.0170	.....	E = 27,774,000.
102,600	18,000	.1237	.0120	.....	
114,000	20,000	.1453	.0208	.....	E = 28,125,000.
116,000	.....	.1499	.....	.....	
118,000	.....	.1533	.....	.....	
120,000	.....	.1575	.....	.....	
122,000	.....	.1609	.....	.....	
124,000	.....	.1658	.....	.....	
126,000	.....	.1720	.....	.....	
128,000	22,456	.1803	.....	.....	Elastic limit.
130,000	.....	.2030	.....	.....	
132,000	.....	.2200	.....	.....	
134,000	.....	.2458	.....	.....	
136,800	24,000	.3040	.....	.....	
142,500	25,000	.5500	.....	.76	
148,200	26,000	1.12	.....	1.42	
153,900	27,000	1.44	.....	1.80	
159,600	28,000	1.69	.....	2.13	
165,300	29,000	2.27	.....	2.88	Set.
171,000	30,000	2.85	2.62	3.59	3″.25.

Sectional area now called 5.493 square inches.
Gauged length 182″.62.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,700	1,039	0.	0.	.....	Micrometer reset.
28,500	5,191	.0278	.0278	.....	
57,000	10,382	.0625	.0347	.....	E = 27,318,000.
85,500	15,573	.0987	.0362	.....	E = 26,186,000.
114,000	20,764	.1359	.0372	.....	E = 25,483,000.
85,500	15,573	.1024	.0335	.....	
57,000	10,382	.0680	.0344	.....	
28,500	5,191	.0318	.0362	.....	
5,700	1,039	.0013	.0305	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,700	1,039	—.0002	.0015	.....	After ½ hour's rest.
28,500	5,191	.0277	.0279	.....	
57,000	10,382	.0625	.0348	.....	
85,500	15,573	.0977	.0352	.....	
114,000	20,764	.1334	.0357	.....	
142,500	25,955	.1713	.0379	.....	
114,000	20,764	.1377	.0336	.....	
85,500	15,573	.1034	.0343	.....	
57,000	10,382	.0684	.0350	.....	
28,500	5,191	.0320	.0364	.....	
5,700	1,039	.0014	.0306	.....	
176,700	31,000	.....	.....	3.62	
182,400	32,000	.....	.....	3.70	
188,100	33,000	.....	.....	5.28	
193,800	34,000	.....	.....	6.12	
199,500	35,000	.....	.....	6.97	
205,200	36,000	.....	.....	8.02	
210,900	37,000	.....	.....	9.07	
216,600	38,000	.....	.....	10.20	
222,300	39,000	.....	.....	11.57	
228,000	40,000	.....	.....	13.15	
233,700	41,000	.....	.....	14.85	
239,400	42,000	.....	.....	17.05	
24[illegible],100	43,000	.....	.....	19.50	
250,800	44,000	.....	.....	22.45	
0	0	.....	.....	.....	Rested 5 minutes.
256,500	45,000	.....	.....	27.00	
257,100	45,105	.....	.....	27.50	Tensile strength.
.....	.....	.....	.....	27.80	Just before fracture.
0	0	21.01	.....	.....	=11.7 per cent.
0	0	.....	.....	27.66	=11.6 per cent.

Elongation of 10-inch sections, *2″.18; 1″.34, 1″.56, 1″.43, 1″.28, 1″.28, 1″.28, 1″.20, 1″.22, 1″.15, 1″.09, 1″.09, 1″.10, 1″.10, 1″.08, 1″.09, 1″.02, 1″.02, 1″.05, 1″.12, 1″.23, 1″.02, ″.81.

Area at fracture, 4″.22×″.93=3.92 square inches.

Contraction, 31.2 per cent.

One edge of fracture open ″.13. Open at middle ″.15. One edge closed.

Fractured 18½″ from center of pin-hole A. Appearance, fibrous, with traces of granulation.

Elongation of pin-holes, A ″.47, B ″.41.

Fractured end loaded after 16 hours' rest.

Gauged length now 178″.72; beginning three sections from fracture at end A, and terminating at the end of original gauged length, end B. This includes sixteen of the original 10-inch sections.

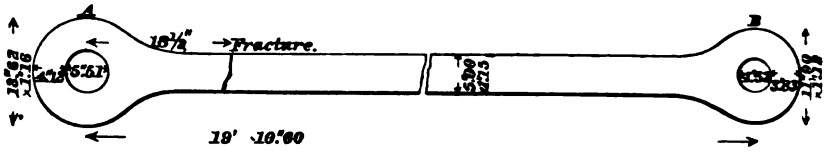
Sectional area now called 5.103 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,700	1,117	0.	0.	.....	Initial load.
28,500	5,585	.0317	.0317	.....	
57,000	11,170	.0691	.0374	.....	
85,500	16,754	.1060	.0369	.....	
114,000	22,339	.1435	.0375	.....	
85,500	16,754	.1072	.0363	.....	
57,000	11,170	.0712	.0360	.....	
28,500	5,585	.0339	.0373	.....	
5,700	1,117	.0030	.0309	.....	
28,500	5,585	.0332	.0302	.....	
57,000	11,170	.0701	.0369	.....	
85,500	16,754	.1068	.0367	.....	
114,000	22,339	.1440	.0372	.....	
142,500	27,924	.1815	.0375	.....	
171,000	33,509	.2205	.0390	.....	
142,500	27,924	.1843	.0362	.....	E=27,572,000.
114,000	22,339	.1479	.0364	.....	E=27,421,000.
85,000	16,754	.1109	.0370	.....	E=26,976,000.
57,000	11,170	.0741	.0368	.....	E=27,123,000.
28,500	5,585	.0365	.0376	.....	E=26,545,000.
5,700	1,117	.0051	.0314	.....	
28,500	5,585	.0352	.0301	.....	
57,000	11,170	.0723	.0371	.....	
85,500	16,754	.1092	.0369	.....	
114,000	22,339	.1466	.0374	.....	
142,500	27,924	.1833	.0367	.....	
171,000	33,509	.2203	.0370	.....	
199,500	39,594	.2609	.0406	.....	
228,000	44,678	.3073	.0464	.....	
199,500	39,594	.2711	.0362	.....	
171,000	33,509	.2348	.0363	.....	
142,500	27,924	.1977	.0371	.....	
114,000	22,339	.1607	.0370	.....	
85,500	16,754	.1234	.0373	.....	
57,000	11,170	.0854	.0380	.....	
28,500	5,585	.0473	.0381	.....	
5,700	1,117	.0147	.0326	.....	
28,500	5,585	.0447	.0300	.....	
57,000	11,170	.0815	.0368	.....	
85,500	16,754	.1188	.0373	.....	
114,000	22,339	.1564	.0376	.....	
142,500	27,924	.1942	.0378	.....	
171,000	33,509	.2320	.0378	.....	
199,500	39,094	.2702	.0382	.....	
171,000	33,509	.2334	.0368	.....	E=27,123,000.
142,500	27,924	.1969	.0365	.....	E=27,345,000.
114,000	22,339	.1596	.0363	.....	E=27,496,000.
85,500	16,754	.1224	.0372	.....	E=26,831,000.
57,000	11,170	.0842	.0382	.....	E=26,759,000.
28,500	5,585	.0469	.0373	.....	
5,700	1,117	.0148	.0321	.....	

Bar again loaded after 26 hours' additional rest. Gauged length (as before), 178″.72.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,700	1,117	0.	0.	.....	Initial load. Micrometer reset.
28,500	5,585	.0295	.0295	.....	
57,000	11,170	.0660	.0365	.....	
85,500	16,754	.1027	.0367	.....	
114,000	22,339	.1395	.0368	.....	
142,500	27,924	.1769	.0374	.....	
171,000	33,509	.2142	.0373	.....	
142,500	27,924	.1780	.0362	.....	E=27,572,000.
114,000	22,339	.1416	.0364	.....	E=27,421,000.
85,500	16,754	.1050	.0366	.....	E=27,271,000.
57,000	11,170	.0688	.0362	.....	E=27,572,000.
28,500	5,585	.0320	.0368	.....	E=27,123,000.
5,700	1,117	.0021	.0299	.....	
Test resumed after additional rest of 5 days 1½ hours.					
5,700	1,117	0.	0.	0.	Initial load. Micrometer reset.
28,500	5,585	.0306	.0306	.....	
57,000	11,170	.0686	.0380	.....	
85,500	16,754	.1058	.0372	.....	
114,000	22,339	.1430	.0372	.....	
142,500	27,924	.1800	.0370	.....	
114,000	22,339	.1435	.0365	.....	
85,500	16,754	.1070	.0365	.....	
57,000	11,170	.0702	.0368	.....	
28,500	5,585	.0327	.0375	.....	
5,700	1,117	.0018	.0309	.....	
28,500	5,585	.0320	.0302	.....	
57,000	11,170	.0693	.0373	.....	
85,500	16,754	.1064	.0371	.....	
114,000	22,339	.1435	.0371	.....	
142,500	27,924	.1803	.0368	.....	
171,000	33,509	.2170	.0367	.....	
142,500	27,924	.1806	.0364	.....	E=27,421,000.
114,000	22,339	.1442	.0364	.....	E=27,421,000.
85,500	16,754	.1076	.0366	.....	E=27,271,000.
57,000	11,170	.0710	.0366	.....	E=27,271,000.
28,500	5,585	.0334	.0376	.....	E=26,545,000.
5,700	1,117	.0023	.0311	.....	

No. 764.



Sectional area of stem, 5.75 square inches.
Gauged length, 180″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,750	1,000	0.	0.	0.	Initial load.
28,750	5,000	.0252	.0006	.....	
57,500	10,000	.0564	.0013	.....	E = 29,508,000.
86,250	15,000	.0894	.0030	.....	E = 28,753,000.
115,000	20,000	.1308	.0117	.....	E = 27,522,000.
.....	5,000	.0368	.....	.....	
.....	10,000	.0680	.....	.....	
.....	15,000	.0997	.....	.....	
.....	20,000	.1324	.....	.....	
120,000	.....	.1402	.....	.....	
122,000	.....	.1434	.....	.....	
124,000	.....	.1473	.....	.....	
126,000	.....	.1513	.....	.....	
128,000	.....	.1555	.....	.....	
130,000	22,610	.1618	.....	.....	Elastic limit.
132,000	.....	.1725	.....	.....	
134,000	.....	.1845	.....	.....	
136,000	.....	.2035	.....	.....	
138,000	24,000	.2360	.....	.....	
140,000	.....	.2725	.....	.....	
143,750	25,000	.29	.....	.48	
149,500	26,000	.43	.....	.69	
155,250	27,000	1.04	.....	1.39	
161,000	28,000	1.56	.....	2.03	
166,750	29,000	.....	.....	2.50	
172,500	30,000	.....	.....	2.92	
178,250	31,000	.....	.....	3.60	
184,000	32,000	.....	.....	4.25	
189,750	33,000	.....	.....	5.01	
195,500	34,000	.....	.....	5.78	
201,250	35,000	.....	.....	6.63	
207,000	36,000	.....	.....	7.60	
212,750	37,000	.....	.....	8.62	
218,500	38,000	.....	.....	9.75	
224,250	39,000	.....	.....	11.09	
230,000	40,000	.....	.....	12.65	
235,750	41,000	.....	.....	14.20	
241,500	42,000	.....	.....	16.48	
247,250	43,000	.....	.....	18.72	
253,000	44,000	.....	.....	22.40	
0	0	.....	.....	.....	Rested 5 minutes.
256,100	44,540	.....	.....	22.60	Tensile strength.
0	0	16.94	.....	.....	= 9.4 per cent.
0	0	.....	.....	22.34	= 9.4 per cent.

Elongation of 10-inch sections, * 1″.77, 1″.10, 1″.07, 1″.06, ″.96 ″.91, ″.88, ″.89, ″.88, ″.90, ″.92, ″.92, ″.93, ″.93, ″.91, ″.83, ″.92, ″.93, 1″.00, 1″.10, ″.91, ″.83.

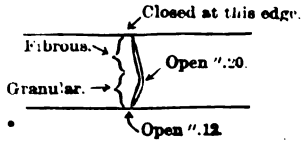
Elongation of pin-holes, A ″.31, B ″.35.

Area at fracture, 4.″36 × .″93 = 4.05 square inches.

Contraction, 29.6.

Fractured 18½″ from center of pin-hole A.

Appearance, granular, 30 per cent.; fibrous, 70 per cent.



One-half hour after fracture bar again loaded.

Gauged length, 185″.92.

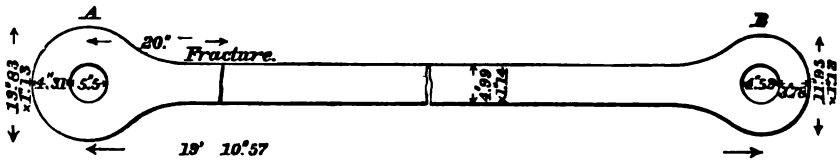
Gauged length includes seventeen of the original 10-inch sections, terminating at end B at same point as original gauged length.

Sectional area now called 5.2588 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,750	1,093	0.	0.	0.	Initial load.
28,750	5,467	.0305	.0305	.....	
57,500	10,934	.0701	.0396	.....	
86,250	16,400	.1093	.0392	.....	
115,000	21,868	.1508	.0415	.....	
143,750	27,335	.1947	.0439	.....	
172,500	32,801	.2401	.0454	.....	
143,753	27,335	.2030	.0371	.....	E=27,396,000.
115,000	21,868	.1645	.0385	.....	E=26,400,000.
86,250	16,400	.1252	.0393	.....	E=25,863,000.
57,500	10,934	.0856	.0396	.....	E=25,667,000.
28,750	5,467	.0449	.0407	.....	E=24,973,000.
5,750	1,093	.0107 .0083	.0342 .0176	.....	After 40 minutes' rest.
5,750	1,093	.0004	.0079	.....	After 16 hours' rest.
28,750	5,467	.0316	.0312	.....	
57,500	10,934	.0701	.0385	.....	
86,250	16,400	.1079	.0378	.....	
115,000	21,868	.1464	.0385	.....	
143,750	27,335	.1847	.0383	.....	
172,500	32,801	.2234	.0387	.....	
143,750	27,335	.1857	.0377	.....	
115,000	21,868	.1481	.0376	.....	
86,250	16,400	.1100	.0381	.....	
57,500	10,934	.0722	.0378	.....	
28,750	5,467	.0335	.0387	.....	
5,750	1,093	.0017	.0318	.....	
172,500	32,881	.2236	.2219	.....	
5,750	1,093	.0017	.2219	.....	
Test resumed after 5 days and 3 hours' rest.					
5,750	1,093	0.	0.	.....	Initial load. Micrometer reset.
28,750	5,467	.0310	.0310	.....	
57,500	10,934	.0697	.0387	.....	
86,250	16,400	.1076	.0379	.....	
115,000	21,868	.1462	.0386	.....	
143,750	27,335	.1841	.0379	.....	
172,500	32,801	.2221	.0380	.....	
143,750	27,335	.1845	.0376	.....	E=27,032,000.
115,000	21,868	.1470	.0375	.....	E=27,104,000.
86,250	16,400	.1090	.0380	.....	E=26,747,000.
57,500	10,934	.0711	.0379	.....	E=26,818,000.
28,750	5,467	.0322	.0389	.....	E=26,129,000.
5,750	1,093	.0006	.0316	.....	
28,750	5,467	.0316	.0310	.....	
57,500	10,934	.0701	.0385	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
86, 250	16, 400	.1082	.0381	.....	
115, 000	21, 868	.1464	.0382	.....	
143, 750	27, 335	.1841	.0377	.....	
172, 500	32, 801	.2220	.0379	.....	
143, 750	27, 335	.1844	.0376	.....	
115, 000	21, 868	.1471	.0373	.....	
86, 250	16, 400	.1091	.0380	.....	
115, 000	21, 868	.1470	.0379	.....	
143, 750	27, 335	.1845	.0375	.....	
172, 500	32, 801	.2224	.0379	.....	
143, 750	27. 335	.1844	.0380	.....	E=26, 747, 000.
115, 000	21, 868	.1470	.0374	.....	E=27, 177, 000.
86, 250	16, 400	.1090	.0380	.....	E=26, 747, 000.
57, 500	10, 934	.0713	.0377	.....	E=26, 960, 000.
28, 750	5, 467	.0324	.0389	.....	E=26, 129, 000.
5, 750	1, 093	.0004	.0320	.....	

No. 765.



Sectional area of stem, 5.69 square inches.
Gauged length, 180″.
Kinks in stem.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5, 690	1, 000	0.	0.	0.	Initial load.
28, 450	5, 000	0386	.0055	.....	
56, 900	10, 000	.0680	.0062	.....	E=27, 950, 000.
85, 350	15, 000	.1030	.0093	.....	
113, 800	20, 000	.1520	.0258	.24	
116, 000	.....	.1600	.....	.....	
118, 000	.....	.1622	.....	.....	
120, 000	.....	.1685	.....	.....	
122, 000	.....	.1730	.....	.....	
124, 000	21, 790	.1778	.....	.....	Elastic limit.
126, 000	.....	.1849	.....	.....	
128, 000	.....	.1965	.....	.....	
130, 000	.....	.2120	.....	.....	
132, 000	.....	.2330	.....	.....	
134, 000	.....	.2495	.....	.....	
136, 560	24, 000	.2901	.....	.47	
142, 250	25, 000	.46	.....	.68	
147, 940	26, 000	.....	.....	.86	
153, 630	27, 000	.....	.....	1. 35	
159, 320	28, 000	.....	.....	1. 83	
165, 010	29, 000	.....	.....	2. 21	
170, 700	30, 000	.....	.....	2. 86	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
176,390	31,000	.....	.....	3.40	
182,080	32,000	.....	.....	4.12	
187,770	33,000	.....	.....	4.85	
193,460	34,000	.....	.....	5.62	Sharp snapping sound.
199,150	35,000	.....	.....	6.64	
204,840	36,000	.....	.....	7.60	
210,530	37,000	.....	.....	8.65	
216,220	38,000	.....	.....	9.87	
221,910	39,000	.....	.....	11.12	Set.
227,600	40,000	.....	.....	13.10	12″.58.
Bar rested under zero load 1 hour.					
5,690	1,000	0.	0.	0.	Initial load. Micrometer reset.
28,450	5,000	.0302	.....	.....	
56,900	10,000	.0683	.....	.....	
85,350	15,000	.1064	.....	.....	
113,800	20,000	.1455	.....	.....	
85,350	15,000	.1853	.....	.....	
113,800	20,000	.....	.....	.....	
142,250	25,000	.....	.....	.....	
113,800	20,000	.....	.....	.....	
85,350	15,000	.....	.....	.....	
56,900	10,000	.....	.....	.....	
28,450	5,000	.....	.....	.....	
5,690	1,000	.....	.....	.....	
233,290	41,000	.....	.....	13.12	
238,980	42,000	.....	.....	13.48	
244,670	43,000	.....	.....	18.15	
246,500	43,320	.....	.....	19.70	Tensile strength.
0	0	14.04	.....	.....	=7.8 per cent.
0	0	.....	.....	19.14	=8.0 per cent.

Elongation of 10-inch sections: *1″.59, 1″.25, ″.92, ″.86, ″.78, ″.71, ″.73, ″.71, ″.81, ″.77, ″.79, ″.76, ″.78, ″.79, ″.75, ″.74, ″.73, ″.78, ″.81, ″.92, ″.77, ″.71.

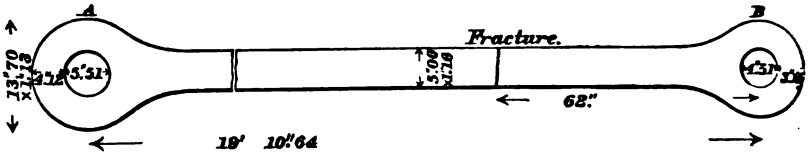
Elongation of pin-holes, A ″.33, B ″.28.

Area at fracture 4″.36 × ″.96 = 4.19 square inches.

Contraction, 26.4 per cent.

Fractured 20″ from center of pin-hole A. Appearance, fibrous, 70 per cent.; granular, 30 per cent. Opened cracks in surface of stem 41″ from center of pin-hole A and 15″ and 37″ from center of pin-hole B. These cracks were in sight when 40,000 pounds tension had been applied to the bar.

No. 766.



Sectional area of stem, 5.80 square inches.
Gauged length, 180″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5, 800	1, 000	0.	0.	0.	Initial load.
29, 000	5, 000	.0310	.0031	.....	
58, 000	10, 000	.0662	.0044	.....	E = 27,355,000.
87, 000	15, 000	.1028	.0078	.....	Set.
116, 000	20, 000	.1512	.0236	.26	″.05.
118, 000	.....	.1582	.....	.....	
120, 000	.....	.1627	.....	.....	
122, 000	.....	.1674	.....	.....	
124, 000	.....	.1717	.....	.....	
126, 000	.....	.1760	.....	.....	
128, 000	.....	.1815	.....	.....	
130, 000	22, 410	.1890	.....	.....	Elastic limit.
132, 000	.....	.2000	.....	.....	
133, 400	23, 000	.225	.....	.35	
136, 000	.....	.24	.....	.....	
138, 000	.....	.26	.....	.....	
139, 200	24, 000	.28	.....	.....	
145, 000	25, 000	.38	.....	.57	
150, 800	26, 000	.....	.....	.80	
156 600	27, 000	.....	.....	1.32	
162, 400	28, 000	.....	.....	1.70	
168, 200	29, 000	.....	.....	2.22	
174, 000	30, 000	.....	.....	2.81	
179, 800	31, 000	.....	.....	3.40	
185, 600	32, 000	.....	.....	4.20	
191, 400	33, 000	.....	.....	4.93	
197, 200	34, 000	.....	.....	5.70	
203, 000	35, 000	.....	.....	6.72	
208, 800	36, 000	.....	.....	7.76	
214, 600	37, 000	.....	.....	8.95	
220, 400	38, 000	.....	.....	10.11	
226, 200	39, 000	.....	.....	11.40	
229, 400	39, 550	.....	.....	12.25	Tensile strength.
0	0	9.20	.....	.....	= 5.1 per cent.
0	0	.....	.....	11.40	= 4.8 per cent.

Elongation of 10-inch sections, ″.49, ″.52, ″.52, ″.50, ″.48, ″.48, ″.47, ″.47, ″.47, ″.47, ″.47, ″.45, ″.51, ″.52, ″.48, ″.51, *″.77, ″.52, ″.58, ″.53, ″.56, ″.52.

Elongation of pin-holes, A ″.19, B ″20.

Area at fracture, 4″.80 × 1″.09 = 5.23 square inches.

Contraction, 9.8 per cent.

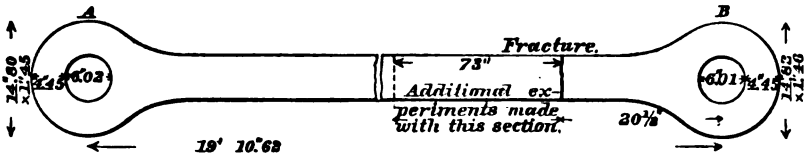
Fractured 62″ from center of pin-hole B.

Appearance, granular, 30 per cent.; fibrous, 70 per cent.

When fractured ends are brought together they closed at the fibrous edge, leaving an opening of ″.15 at the granular edge.

Between the point of rupture and head B ragged cracks were developed, seven in number, on one face, at regular intervals of about 7½″ apart. On the other face of the stem at this end, also on both faces of the longer fractured end, similar cracks were developed.

No 767.



Sectional area of stem, 8.71 square inches.
Gauged length, 180″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
8, 710	1, 000	0.	0.	0.	Initial load.
43, 550	5, 000	.0254	.0006	.....	
87, 100	10, 000	.0574	.0012	.....	E=28, 800, 000.
130, 650	15, 000	.0925	.0049	.....	
156, 780	18, 000	.1225	.0157	.....	
168, 000	.....	.1360	.0348	.....	
172, 000	19, 750	.1420	.....	.....	Elastic limit.
174, 200	20, 000	.1535	.....	.....	
176, 000	.....	.1752	.....	.....	
178, 000	.....	.1890	.....	.....	
180, 000	.....	.2035	.....	.....	
182, 910	21, 000	.2250	.....	.40	
186, 000	.....	.25	.....	.....	
191, 620	22, 000	.30	.....	.53	
200, 330	23, 000	.....	.....	.82	
209, 040	24, 000	.....	.....	1.36	
217, 750	25, 000	.....	.....	1.66	
226, 460	26, 000	.....	.....	2.12	
235, 170	27, 000	.....	.....	2.71	
243, 880	28, 000	.....	.....	3.30	
252, 590	29, 000	.....	.....	4.05	
261, 300	30, 000	.....	.....	4.75	
270, 010	31, 000	.....	.....	5.60	
278, 720	32, 000	.....	.....	6.45	
287, 430	33, 000	.....	.....	7.36	
296, 140	34, 000	.....	.....	8.32	
304, 850	35, 000	.....	.....	9.41	
313, 560	36, 000	.....	.....	10.70	
322, 270	37, 000	.....	.....	12.02	
330, 980	38, 000	.....	.....	13.41	
339, 690	39, 000	.....	.....	15.20	Set.
348, 400	40, 000	.....	.....	17.30	16″.80.
0	0	.....	.....	.....	Rested 5 minutes.
357, 110	.....	.....	.....	20.10	
365, 820	.....	.....	.....	23.35	
374, 530	.....	.....	.....	27.70	
376, 800	.....	.....	.....	29.65	Tensile strength.
0	0	21.69	.....	.....	= 12.05 per cent.
0	0	.....	.....	28.86	= 12.09 per cent.

Elongation of 10-inch sections, 1″.02, 1″.38, 1″.53, 1″.23, 1″.08 1″.08, 1″.02, 1″.03, 1″.15, 1″.12, 1″.08, 1″.08, 1″.09, 1″.11, 1″.16, 1″.08, 1″.15, 1″.21, 1″.33, 1″.60, 1″.64, 2″.17, *1″.21.

Elongation of pin-holes, A ″.62, B ″.56.

Fractured 20½″ from center of pin-hole B.

Appearance, granular, 80 per cent.; fibrous, 20 per cent. Started cracks in neck and sides of pin-hole head A.

Area of fracture, 5″.58×1″.28=7.14 square inches.

Contraction, 18.0 per cent.

Area 2½″ from point of rupture, 5″.37×1″22=6.55 square inches.

Contraction, 24.8 per cent.

Gauged length, 178″.45; includes sixteen of the original 10-inch sections, beginning at end A of the original gauged length.

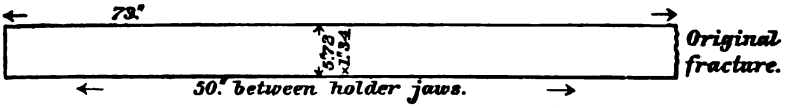
Sectional area called 7.809 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
8,710	1,115	0.	0.	0.	Initial load. Micrometer reset.
43,550	5,577	.0307	.0307	.....	
87,100	11,153	.0680	.0373	.....	
130,650	16,730	.1056	.0376	.....	
174,200	22,306	.1452	.0396	.....	
217,750	27,883	.1855	.0403	.....	
174,200	22,306	.1491	.0364	.....	
130,650	16,730	.1118	.0373	.....	
87,100	11,153	.0740	.0378	.....	
43,550	5,577	.0354	.0386	.....	
8,710	1,115	.0040	.0314	.....	
174,200	22,306	.1462	.1422	.....	Load left on bar overnight, 15 hours.
111,000	.....	.0860	.0602	.....	Load on bar after 15 hours' rest.
174,200	22,306	.1387	.0527	.....	
130,650	16,730	.1026	.0361	.....	
87,100	11,153	.0661	.0365	.....	
43,550	5,577	.0294	.0367	.....	
8,710	1,115	—.0006	.0300	.....	
43,550	5,577	.0285	.0291	.....	
87,100	11,153	.0653	.0368	.....	
130,650	16,730	.1022	.0369	.....	
174,200	22,306	.1390	.0368	.....	
130,650	16,730	.1028	.0362	.....	
87,100	11,153	.0665	.0363	.....	
43,550	5,577	.0297	.0368	.....	
8,710	1,115	.0001	.0296	.....	
43,550	5,577	.0292	.0291	.....	
87,100	11,153	.0659	.0367	.....	
130,650	16,730	.1026	.0367	.....	
174,200	22,306	.1396	.0370	.....	
130,650	16,730	.1032	.0364	.....	
87,100	11,153	.0669	.0363	.....	
43,550	5,577	.0300	.0369	.....	
8,710	1,115	.0003	.0297	.....	
43,550	5,577	.0295	.0292	.....	
87,100	11,153	.0664	.0369	.....	
130,650	16,730	.1032	.0368	.....	
174,200	22,306	.1401	.0369	.....	
217,750	28,883	.1769	.0368	.....	
261,300	34,459	.2139	.0370	.....	
304,850	40,036	.2512	.0373	.....	
261,300	34,459	.2147	.0365	.....	
217,750	28,883	.1780	.0367	.....	
174,200	22,306	.1418	.0362	.....	
130,650	16,730	.1052	.0366	.....	
87,100	11,153	.0684	.0368	.....	
43,550	5,577	.0313	.0371	.....	
8,710	1,115	.0010	.0303	.....	
43,550	5,577	.0303	.0293	.....	
87,100	11,153	.0671	.0368	.....	
130,650	16,730	.1040	.0369	.....	
174,200	22,306	.1411	.0371	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
130, 650	16, 730	.1046	.0365	.....	
87, 100	11, 153	.0681	.0365	.....	
43, 550	5, 576	.0313	.0368	.....	
8, 710	1, 115	.0012	.0301	.....	
Test resumed after an additional rest of 47 hours.					
8, 710	1, 115	0.	0.	0.	Initial load. Micrometer reset.
43, 550	5, 577	.0305	.0305	.....	
87, 100	11, 153	.0671	.0366	.....	
130, 650	16, 730	.1036	.0365	.....	
174, 200	22, 306	.1406	.0370	.....	
130, 650	16, 730	.1045	.0361	.....	
87, 100	11, 153	.0684	.0361	.....	
43, 550	5, 577	.0319	.0365	.....	
8, 710	1, 115	.0021	.0298	.....	
43, 550	5, 577	.0315	.0294	.....	
87, 100	11, 158	.0681	.0366	.....	
130, 650	16, 730	.1048	.0367	.....	
174, 200	22, 306	.1415	.0367	.....	
217, 750	28, 883	.1781	.0366	.....	
261, 300	34, 459	.2151	.0370	.....	
304, 850	40, 036	.2527	.0376	.....	
261, 300	34, 459	.2166	.0361	.....	
217, 750	28, 883	.1802	.0364	.....	
174, 200	22, 306	.1440	.0362	.....	
130, 650	16, 730	.1074	.0366	.....	
87, 100	11, 153	.0711	.0363	.....	
43, 550	5, 577	.0341	.0370	.....	
8, 710	1, 115	.0040	.0301	.....	Test discontinued.

TEST BY TENSILE AND COMPRESSIVE STRESSES OF A SECTION OF FRACTURED WROUGHT-IRON EYE-BAR, NO. 767.

[Reloaded after an interval of 104 days.]



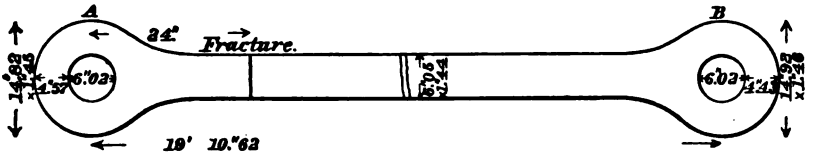
Sectional area (approximate), 7.66 square inches.
Gauged length, 30″.

Applied loads.		In gauged length.				Remarks.
Total.	Per square inch.	Elongation.	Set.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
7,660	1,000	0.	0.	.....	.....	Initial load
38,300	5,000	.0043	.....	.....	.....	
76,600	10,000	.0098	.....	.....	.....	
114,900	15,000	.0153	.....	.....	.....	
153,200	20,000	.0208	.....	.....	.....	
191,500	25,000	.0265	.....	.....	.....	
229,800	30,000	.0318	.....	.....	.....	
191,500	25,000	.0265	.....	.....	.....	
153,200	20,000	.0210	.....	.....	.....	
114,900	15,000	.0155	.....	.....	.....	
76,600	10,000	.0102	.....	.....	.....	
38,300	5,000	.0046	.....	.....	.....	
7,660	1,000	.0003	.0003	.....	.....	
7,660	1,000	.....	.....	0.	0.	Initial load.
38,300	5,000	.....	.....	.0041	.....	
76,600	10,000	.....	.....	.0094	.....	
114,900	15,000	.....	.....	.0147	.....	
153,200	20,000	.....	.....	.0199	.....	
191,500	25,000	.....	.....	.0252	.....	
153,200	20,000	.....	.....	.0201	.....	
114,900	15,000	.....	.....	.0150	.....	
76,600	10,000	.....	.....	.0097	.....	
38,300	5,000	.....	.....	.0046	.....	
7,660	1,000	.....	.....	.0002	.....	
7,660	1,000	0.	0.	.....	.....	Initial load.
38,300	5,000	.0043	.....	.....	.....	
76,600	10,000	.0098	.....	.....	.....	
114,900	15,000	.0152	.....	.....	.....	
153,200	20,000	.0207	.....	.....	.....	
191,500	25,000	.0262	.....	.....	.....	
153,200	30,000	.0318	.....	.....	.....	
191,500	25,000	.0264	.....	.....	.....	
229,800	20,000	.0210	.....	.....	.....	
114,900	15,000	.0154	.....	.....	.....	
76,600	10,000	.0100	.....	.....	.....	
38,300	5,000	.0048	.....	.....	.....	
7,660	1,000	.0002	.....	.....	.....	
7,660	1,000	.....	.....	0.	0.	Initial load.
38,300	5,000	.....	.....	.0042	.....	
76,600	10,000	.....	.....	.0094	.....	
114,900	15,000	.....	.....	.0147	.....	
153,200	20,000	.....	.....	.0198	.....	
191,500	25,000	.....	.....	.0248	.....	
153,200	20,000	.....	.....	.0198	.....	
114,900	15,000	.....	.....	.0147	.....	
76,600	10,000	.....	.....	.0096	.....	
38,300	5,000	.....	.....	.0043	.....	
7,660	1,000	.....	.....	.0002	.....	
7,660	1,000	0.	0.	.....	.....	Initial load.
229,800	30,000	.0320	.....	.....	.....	
268,100	35,000	.0375	.....	.....	.....	
306,400	40,000	.0432	.....	.....	.....	
268,100	35,000	.0377	.....	.....	.....	
229,800	30,000	.0320	.....	.....	.....	
191,500	25,000	.0270	.....	.....	.....	
153,200	20,000	.0215	.....	.....	.....	
114,900	15,000	.0160	.....	.....	.....	
76,600	10,000	.0105	.....	.....	.....	
38,300	5,000	.0050	.....	.....	.....	
7,660	1,000	.0005	.....	.....	.....	

Applied loads.		In gauged length.				Remarks.
Total.	Per square inch.	Elongation.	Set.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
7,660	1,000	.....	.....	0.	0.	Initial load.
38,300	5,000	.....	.....	.0043	.....	
76,600	10,000	.....	.....	.0097	.....	
114,000	15,000	.....	.....	.0150	.....	
153,200	20,000	.....	.....	.0203	.....	
191,500	25,000	.....	.....	.0255	.....	
229,800	30,000	.....	.....	.0294	.....	
191,500	25,000	.....	.....	.0248	.....	
153,200	20,000	.....	.....	.0202	.....	
114,900	15,000	.....	.....	.0154	.....	
76,600	10,000	.....	.....	.0105	.....	
38,300	5,000	.....	.....	.0154	.....	
7,660	1,000	.....	.....	.0013	.....	

NOTE.—Under compression stresses the bar deflected upwards, the micrometer being on the convex side.

No. 768.



Sectional area of stem, 8.71 square inches.
Gauged length, 180″.
Stem of bar curved perpendicular to plane of pins. V. sine ¼″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
8,710	1,000	0.	0.	0.	Initial load.
43,550	5,000	.0263	.0003	.....	
87,100	10,000	.0590	.0008	.....	E=28,301,000.
130,650	15,000	.0937	.0030	.....	
156,780	18,000	.1170	.0075	.....	
158,000	.....	.1194	.....	.....	
160,000	.....	.1215	.....	.....	
162,000	.....	.1235	.....	.....	
164,000	.....	.1252	.....	.....	
166,000	.....	.1274	.....	.....	
168,000	.....	.1294	.....	.....	
170,000	.....	.1319	.....	.....	
172,000	.....	.1340	.....	.....	
174,200	20,000	.1368	.0150	.27	Set, .05.
176,000	.....	.1401	.....	.....	
178,000	.....	.1447	.....	.....	Rested 3 minutes.
180,000	.....	.1463	.....	.....	
182,000	.....	.1497	.....	.....	
184,000	.....	.1512	.....	.....	
186,000	.....	.1527	.....	.....	
188,000	.....	.1547	.....	.....	
190,000	.....	.1573	.....	.....	
192,000	.....	.1595	.....	.....	
194,000	.....	.1623	.....	.....	
196,000	.....	.1661	.....	.....	
198,000	22,730	.1712	.....	.....	Elastic limit.
200,000	.....	.1810	.....	.....	
202,000	.....	.1885	.....	.....	
204,000	.....	.1960	.....	.....	
206,000	.....	.2055	.....	.....	
8,710	.....	.....	.....	.....	Rested 1 hour.
208,000	.....	.2108	.....	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
209, 040	24, 000	.2207	.....	.....	
210, 000	.....	.2296	.....	.....	
212, 000	.....	.2478	.....	.....	
217, 750	25, 000	.29	.....	.57	
226, 460	26, 000	.....	.....	.69	
235, 170	27, 000	.....	.....	1.00	
243, 880	28, 000	.....	.....	1.70	
252, 590	29, 000	.....	.....	2.24	
261, 300	30, 000	.....	.....	2.75	
270, 010	31, 000	.....	.....	3.36	
278, 720	32, 000	.....	.....	4.00	
287, 430	33, 000	.....	.....	4.75	Sharp, snapping sound.
296, 140	34, 000	.....	.....	5.58	
304, 850	35, 000	.....	.....	6.52	
313, 560	36, 000	.....	.....	7.41	Snapping sounds continued at intervals.
322, 270	37, 000	.....	.....	8.54	
330, 980	38, 000	.....	.....	9.70	
339, 690	39, 000	.....	.....	11.07	
348, 400	40, 000	.....	.....	12.50	
357, 110	41, 000	.....	.....	14.10	
365, 820	42, 000	.....	.....	.....	
366, 000	42, 020	.....	.....	.....	Tensile strength.
0	0	11.77	.....	.....	=6.5 per cent.
0	0	.....	.....	15.81	=6.6 per cent.

Elongation of 10-inch sections, ″.70, *1″.29, ″.76, ″.76, ″.70, ″.66, ″.63, ″ 64, ″.63, ″.60, ″.61, ″.62, ″.68, ″.63, ″.61, ″.60, ″.60, ″.65, ″.70, ″.69, ″.72, ″57.

Elongation of pin-holes, A ″.45, B ″.29.

Area at fracture, 5″.68 × 1″.24 = 7.04 square inches.

Contraction, 19.2 per cent.

Fractured 24″ from center of pin-hole A. Appearance, granular at one edge, 5 per cent. fibrous for the balance of the fracture, with slight granulation in this section.

Seams showing imperfect welding in the rolling. Seven distinct layers of metal displayed.

Opened small granular cracks in neck of head B.

TABULATION OF TENSILE TESTS OF STEEL AND WROUGHT-IRON EYE-BARS.

No. of test.	Kind of metal.	Dimensions.			Sectional area.	Elastic limit per square inch.	Tensile strength.		Elongation.		Contraction of area.	Modulus of elasticity per square inch.	Maximum compression on pin-holes per square inch.	Fracture.	
		Length (center to center of pin-holes).	Width.	Thickness.			Total.	Per square inch.	In gauged length.	Center to center of pin-holes.				Location.	Appearance.
		Inches.	*Inches.*	*Inches.*	*Sq. inches.*	*Pounds.*	*Pounds*	*Pounds.*	*Per ct.*	*Per ct.*	*Per ct.*	*Pounds.*	*Pounds.*		
4134	Steel	308.00	5.16	1.02	5.26	34,610	341,200	64,870	7.4	7.3	.....	31,400,900	74,1[illegible]3	.....	
4135	....do	308.00	5.14	1.02	5.24	34,730	3[illegible]3,300	69,230	10.4	10.3	.....	29,279,000	8[illegible],093	.....	
4136	....do	308.00	5.15	1.02	5.25	37,330	369,000	70,286	11.7	11.5	.....	29,017,000	80,043	.....	
4137	....do	308.10	5.14	1.02	5.24	35,000	368,000	70,229	11.6	11.4	13.4	.....	79,826	Stem	Granular, radiating from a button of hard metal.
4138	....do	308.00	5.13	1.02	5.23	35,950	374,900	71,680	11.8	11.5	.....	.....	81,323	.....	
4139	....do	307.95	5.15	1.02	5.25	35,000	372,200	70,895	12.1	11.8	.....	30,162,000	80,737	.....	
763	Wrought iron	238.55	5.00	1.14	5.70	22,456	257,100	45,105	11.7	11.6	31.2	28,037,000	52,763	Stem	Fibrous traces of granulation.
764	....do	238.60	5.00	1.15	5.75	22,610	256,100	44,540	9.4	9.4	29.6	28,125,000	50,588	...do	Fibrous, 70 per cent.; granular, 30 per cent.
765	....do	238.57	4.99	1.14	5.69	21,790	246,500	43,320	7.8	8.0	26.4	27,950,000	48,492	...do	Do.
766	....do	238.64	5.00	1.16	5.80	22,410	229,400	39,550	5.1	4.8	9.8	27,355,000	45,013	...do	Do.
767	....do	238.62	6.05	1.44	8.71	19,750	376,800	43,260	12.05	12.09	24.8	28,800,000	43,166	...do	Granular, 80 per cent.; fibrous, 20 per cent.
768	....do	238.62	6.05	1.44	8.71	22,730	366,000	42,020	6.5	6.6	19.2	28,301,000	41,929	...do	Granular 5 per cent. at one edge, fibrous for balance of fracture.

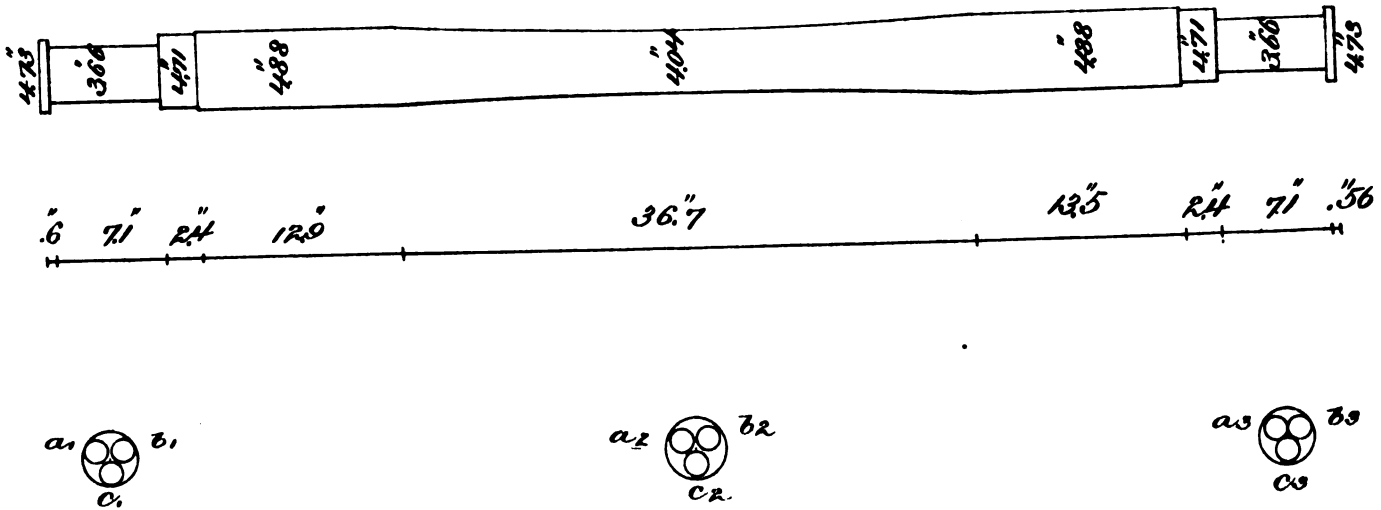
The gauged length of the steel eye-bars was 260″. The moduli of elasticity computed between 25,000 and 30,000 pounds per square inch.
The gauged length of the wrought-iron eye-bars was 180″. The moduli of elasticity computed between 5,000 and 10,000 pounds per square inch.

WROUGHT-IRON RAILWAY AXLE.

CONTINUATION OF TESTS.

SEE REPORT, 1885.

Muck bar axle No. 4.



Specimens from muck-bar axle No. 4 after the axle had run 163,138 miles.

Comparing these results with earlier tests of this series, the tensile strength of the metal in this axle is lower and the modulus of elasticity less than shown by the preceding axles.

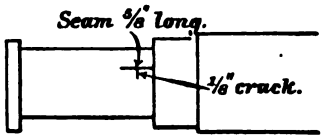
The variations in strength, elasticity, and ductility are no greater, however, than those met in different specimens of new iron of nominally the same grade, and while apparently there is a deterioration in quality, it needs confirmation of a more decisive nature from the remaining axles before attributing this result to the influence of the work done in service.

Specimens Nos. 805, 806, and 807 all fractured at about the same distance from the end of the axle, or nearly opposite the shoulder at the inside end of the journal-bearing.

In the vicinity of these fractures the fibers of the metal converge from the larger diameter of the axle and were oblique to the axes of the test specimens.

The fracture of specimen No. 806 followed the direction of the fiber a distance of 1½", the balance of the fracture being across fibrous metal.

In rough-turning this specimen a small crack opened from a seam located in the axle at the place shown by this sketch:



Lengthwise the axle the seam extended ⅝"; at right angles to it the crack opened ⅛" long.

About four weeks intervened between the time the axle was taken from the tender truck, where it was run, and the time of testing the specimens.

The disturbance in the modulus of elasticity by overstraining the metal, investigated more at length with steel and wrought-iron eyebars, is here shown by bar No. 813 after having been loaded with 34,000 pounds per square inch tension.

No. 805.

Marks, $\frac{MB_4}{a_1}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	.0001	
15,000	15,000	.0051	.0001	
20,000	20,000	.0080	.0011	Elastic limit.
20,500	20,500	.0095	.....	
21,000	21,000	.0177	.....	
21,500	21,500	.0251	.....	
22,000	22,000	.0290	.....	
22,500	22,500	.0370	.....	
23,000	23,000	.0448	.....	
23,500	23,500	.0507	.....	
24,000	24,000	.0630	.....	
24,500	24,500	.0750	.....	
25,000	25,000	.0904	.0813	
5,000	5,000	.0827	.....	
10,000	10,000	.0846	.....	
15,000	15,000	.0864	.....	
20,000	20,000	.0884	.0813	
26,000	26,000	.1103	.....	
27,000	27,000	.1375	.....	
28,000	28,000	.1674	.....	
29,000	29,000	.19	.....	
30,000	30,000	.21	.....	
31,000	31,000	.24	.....	
32,000	32,000	.29	.....	
33,000	33,000	.32	.....	
34,000	34,000	.36	.....	
35,000	35,000	.43	.....	
36,000	36,000	.47	.....	
37,000	37,000	.51	.....	
38,000	38,000	.59	.....	
39,000	39,000	.66	.....	
40,000	40,000	.74	.....	
41,000	41,000	.83	.....	
42,000	42,000	.92	.....	
43,000	43,000	1.11	.....	
44,000	44,000	1.32	.....	
45,000	45,000	1.60	.....	
45,420	45,420	2.00	.....	Tensile strength.
36,000	36,000	.....	.....	Load at time of fracture.
0	0	2.31	.....	=23.1 per cent.

Elongation of inch sections, ″.38, *″.54, ″.23, ″.19, ″.18, ″.17, ″.15, ″.16, ″.15, ″.16.

Diameter at fracture, ″.84. Area, .554 square inch.

Contraction, 44.6 per cent.

Fractured 3″ from neck or 6½″ from end of axle. Appearance, fibrous, seamy.

No. 806.

Marks, $\frac{MB_4}{b_1}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0029	0.	
15,000	15,000	.0049	.0002	
18,000	18,000	.0065	.....	
18,500	18,500	.0068	.....	
19,000	19,000	.0072	.....	
19,500	19,500	.0078	.....	Elastic limit.
20,000	20,000	.0097	.0029	
20,500	20,500	.0120	.....	
21,000	21,000	.0155	.....	
21,500	21,500	.0177	.....	
22,000	22,000	.0215	.....	
23,000	23,000	.0329	.....	
24,000	24,000	.0458	.....	
25,000	25,000	.0687	.....	
26,000	26,000	.0881	.....	
27,000	27,000	.1135	.....	
28,000	28,000	.1436	.....	
29,000	29,000	.1680	.....	
30,000	30,000	.1975	.....	
31,000	31,000	.23	.....	
32,000	32,000	.27	.....	
33,000	33,000	.31	.....	
34,000	34,000	.37	.....	
35,000	35,000	.40	.....	
36,000	36,000	.46	.....	
37,000	37,000	.50	.....	
38,000	38,000	.58	.....	
39,000	39,000	.64	.....	
40,000	40,000	.73	.....	
41,000	41,000	.83	.....	
42,000	42,000	.99	.....	
43,000	43,000	1.17	.....	
43,310	43,310	1.30	.....	Tensile strength.
33,000	.....	.....	.....	Load at time of fracture.
0	0	1.67	.....	=16.7 per cent.

Elongation of inch sections, ″.16, *″.55, ″.17, ″.12, ″.12, ″.12, ″.11, ″.09, ″.11.

Diameter of fracture, ″.87. Area, ″.594.

Contraction, 40.6 per cent.

Fractured 3″ from neck or 6½″ from end of axle. Appearance fibrous, followed a seam 1½″.

No. 807.

Marks, $\frac{MB_4}{c_1}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0049	0.	
18,000	18,000	.0060	.....	
18,500	18,500	.0062	.....	
19,000	19,000	.0064	.....	
19,500	19,500	.0070	.....	
20,000	20,000	.0075	.....	Elastic limit.
20,500	20,500	.0089	.....	
21,000	21,000	.0135	.....	
21,500	21,500	.0190	.....	
22,000	22,000	.0251	.....	
23,000	23,000	.0374	.....	
24,000	24,000	.0487	.....	
25,000	25,000	.0675	.....	
26,000	26,000	.0940	.....	
27,000	27,000	.1170	.....	
28,000	28,000	.1475	.....	
29,000	29,000	.1720	.....	
30,000	30,000	.2050	.....	
31,000	31,000	.25	.....	
32,000	32,000	.29	.....	
33,000	33,000	.32	.....	
34,000	34,000	.36	.....	
35,000	35,000	.41	.....	
36,000	36,000	.47	.....	
37,000	37,000	.51	.....	
38,000	38,000	.58	.....	
39,000	39,000	.65	.....	
40,000	40,000	.72	.....	
41,000	41,000	.81	.....	
42,000	42,000	.92	.....	
43,000	43,000	1.07	.....	
44,000	44,000	1.24	.....	
45,000	45,000	1.51	.....	
45,290	45,290	1.74	.....	Tensile strength.
37,000	37,000	.....	.....	Load at time of fracture.
0	0	2.18	.....	=21.8 per cent.

Elongation of inch sections, ″.27, ″.62,* ″.25, ″.19, ″.16, ″.14, ″.14, ″.15, ″.14, ″.12.
Diameter at fracture, ″.85. Area, .567 square inch.
Contraction, 43.3 per cent.
Fractured 3¼″ from neck or 6¾″ inch from end of axle.
Appearance, fibrous. Considerable cinder present.

No. 808.

Marks, $\frac{MB_4}{a_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	.0001	
15,000	15,000	.0051	.0001	
18,000	18,000	.0061	.0002	
18,500	18,500	.0063	.....	
19,000	19,000	.0067	.....	
19,500	19,500	.0069	.....	
20,000	20,000	.0071	.0004	
20,500	20,500	.0073	.....	
21,000	21,000	.0076	.....	
21,500	21,500	.0078	.....	
22,000	22,000	.0081	.....	
22,500	22,500	.0083	.....	
23,000	23,000	.0089	.....	
23,500	23,500	.0092	.....	
24,000	24,000	.0097	.....	
24,500	24,500	.0103	.....	
25,000	25,000	.0109	.0024	Elastic limit
25,500	25,500	.0155	.....	
26,000	26,000	.0230	.....	
26,500	26,500	.0322	.....	
27,000	27,000	.0412	.....	
27,500	27,500	.0480	.....	
28,000	28,000	.0565	.....	
29,000	29,000	.0760	.....	
30,000	30,000	.1092	.....	
31,000	31,000	.1340	.....	
32,000	32,000	.1650	.....	
33,000	33,000	.2000	.....	
34,000	34,000	.23[illegible]0	.....	
35,000	35,000	.2820	.2682	
.....	1,000	.2682	.....	
.....	5,000	.2698	.....	
.....	10,000	.2717	.....	
.....	15,000	.2738	.....	
.....	20,000	.2758	.....	
.....	25,000	.2780	.....	
.....	30,000	.2802	.....	
.....	25,000	.2784	.....	
.....	20,000	.2764	.....	
.....	15,000	.2745	.....	
.....	10,000	.2723	.....	
.....	5,000	.2702	.....	
.....	1,000	.2684	.....	
36,000	36,000	.3050	.....	
37,000	37,000	.3640	.....	
38,000	38,000	.42	.....	
39,000	39,000	.50	.....	
40,000	40,000	.58	.....	
41,000	41,000	.64	.....	
42,000	42,000	.72	.....	
43,000	43,000	.87	.....	
44,000	44,000	.99	.....	
45,000	45,000	1.18	.....	
46,000	46,000	1.50	.....	
46,440	46,440	2.00	.....	Tensile strength.
40,500	.....	.....	.....	Load at time of fracture.
0	0	2.41	.....	=24.1 per cent.

Elongation of inch sections, ″.17, ″.19, ″.30, *″.58, ″.26, ″.23, ″.19, ″.15, ″.18, ″.16.
Diameter at fracture, ″.81.
Area, .515 square inch.
Contraction, 48.5 per cent.
Fractured, 5″.4 from neck. Appearance, fibrous.

No. 809.

Marks, $\frac{MB_4}{b_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
18,000	18,000	.0060	0.	
20,000	20,000	.0067	0.	
20,500	20,500	.0069	.....	
21,000	21,000	.0071	.....	
21,500	21,500	.0073	.....	
22,000	22,000	.0076	.....	
22,500	22,500	.0078	.....	
23,000	23,000	.0082	.....	
23,500	23,500	.0085	.....	
24,000	24,000	.0090	.....	
24,500	24,500	.0098	.....	Elastic limit.
25,000	25,000	.0122	.0038	
25,500	25,500	.0235	.....	
26,000	26,000	.0410	.....	
26,500	26,500	.0490	.....	
27,000	27,000	.0595	.....	
27,500	27,500	.0692	.....	
28,000	28,000	.0796	.....	
29,000	29,000	.1020	.....	
30,000	30,000	.1245	.....	
31,000	31,000	.1550	.....	
32,000	32,000	.1865	.....	
33,000	33,000	.2310	.....	
34,000	34,000	.2640	.....	
35,000	35,000	.3000	.....	
36,000	36,000	.3530	.....	
37,000	37,000	.39	.....	
38,000	38,000	.47	.....	
39,000	39,000	.53	.....	
40,000	40,000	.60	.....	
41,000	41,000	.68	.....	
42,000	42,000	.80	.....	
43,000	43,000	.96	.....	
44,000	44,000	1.11	.....	
45,000	45,000	1.29	.....	
46,000	46,000	1.72	.....	
46,100	46,100	2.05	.....	Tensile strength.
38,800	.....	.....	.....	Load at time of rupture.
0	0	2.53	.....	= 25.3 per cent.

Elongation of inch sections, ″.17, ″.18, ″.24, ″.63, ″.34, ″.23, ″.22, ″.18, ″.17, ″.17.
Diameter at fracture, .″79. Area, .49 square inch.
Contraction, 51.0 per cent.
Fractured 5″.85 from neck. Appearance, fibrous.

No. 810.

Marks, $^{MB_4}_{C_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	.0001	
18,000	18,000	.0061	.0001	
20,000	20,000	.0067	.0001	
20,500	20,500	.0069	.....	
21,000	21,000	.0071	.....	
21,500	21,500	.0073	.....	
22,000	22,000	.0075	.....	
22,500	22,500	.0077	.....	
23,000	23,000	.0078	.....	
23,500	23,500	.0080	.....	
24,000	24,000	.0082	.....	
24,500	24,500	.0084	.....	
25,000	25,000	.0087	.0003	
25,500	25,500	.0089	.....	
26,000	26,000	.0092	.....	
26,500	26,500	.0094	.....	Elastic limit.
27,000	27,000	.0102 .0170	.....	
27,500	27,500	.0257	.....	
28,000	28,000	.0354	.....	
29,000	29,000	.0440	.....	
30,000	30,000	.0630	.....	
31,000	31,000	.0820	.....	
32,000	32,000	.1090	.....	
33,000	33,000	.1385	.....	
34,000	34,000	.1720	.....	
35,000	35,000	.2090	.....	
36,000	36,000	.2480	.....	
37,000	37,000	.2900	.....	
38,000	38,000	.34	.....	
39,000	39,000	.40	.....	
40,000	40,000	.48	.....	
41,000	41,000	.53	.....	
42,000	42,000	.60	.....	
43,000	43,000	.70	.....	
44,000	44,000	.80	.....	
45,000	45,000	.93	.....	
46,000	46,000	1.12	.....	
47,000	47,000	1.36	.....	
47,730	47,730	1.84	.....	Tensile strength.
41,600	.....	.....	.....	Load at time of rupture.
0	0	2.29	.....	=22.9 per cent.

Elongation of inch sections, ″.21, ″.22, ″.35, *″.56, ″.23, ″.19, ″.16, ″.13, ″.13, ″.11.
Diameter at fracture, ″.83. Area, .541 square inch.
Contraction, 45.9 per cent.
Fractured 5″.25 from neck. Appearance, fibrous.

No. 811.

Marks, $\frac{MB_4}{a_2}$
Diameter, 1″.129.
Sectional area 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0049	0.	
18,000	18,000	.0059	0.	
18,500	18,500	.0062	.....	
19,000	19,000	.0064	.....	
19,500	19,500	.0067	.....	
20,000	20,000	.0069	.0003	
20,500	20,500	.0072	.....	
21,000	21,000	.0075	.....	Elastic limit.
21,500	21,500	.0085	.....	
22,000	22,000	.0099	.....	
22,500	22,500	.0112	.....	
23,000	23,000	.0158	.....	
23,500	23,500	.0235	.....	
24,000	24,000	.0328	.....	
25,000	25,000	.0560	.....	
26,000	26,000	.0745	.....	
27,000	27,000	.1040	.....	
28,000	28,000	.1300	.....	
29,000	29,000	.1575	.....	
30,000	30,000	.1900	.....	
31,000	31,000	.2230	.....	
32,000	32,000	.2540	.....	
33,000	33,000	.2930	.....	
34,000	34,000	.3360	.....	
35,000	35,000	.39	.....	
36,000	36,000	.46	.....	
37,000	37,000	.50	.....	
38,000	38,000	.57	.....	
39,000	39,000	.63	.....	
40,000	40,000	.70	.....	
41,000	41,000	.80	.....	
42,000	42,000	.91	.....	
43,000	43,000	1.05	.....	
44,000	44,000	1.25	.....	
45,000	45,000	1.59	.....	
45,370	45,370	1.92	.....	Tensile strength.
0	0	2.20	.....	=22.0 per cent.

Elongation of inch sections, ″.17, ″.16, ″.18, ″.24, ″.43,* ″.25, ″.24, ″.16, ″.18, ″.19.

Diameter at fracture, ″.95. Area, .709 square inch.

Contraction, 29.1 per cent.

Fractured 1½″ from middle of stem or 11⅜″ from end of axle. Appearance, fibrous.

No. 812.

Marks, $\frac{MB_1}{b_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0031	.0001	
15,000	15,000	.0049	.0001	
18,000	18,000	.0058	.0001	
18,500	18,500	.0061	.....	
19,000	19,000	.0064	.....	
19,500	19,500	.0067	.....	
20,000	20,000	{ .0070 / .0077 }	.0006	Elastic limit.
20,500	20,500	.0082	.....	
21,000	21,000	.0107	.....	
21,500	21,500	.0174	.....	
22,000	22,000	.0225	.....	
22,500	22,500	.0290	.....	
23,000	23,000	.0378	.....	
24,000	24,000	.0650	.....	
25,000	25,000	.0900	.....	
26,000	26,000	.1146	.....	
27,000	27,000	.1405	.....	
28,000	28,000	.1650	.....	
29,000	29,000	.1960	.....	
30,000	30,000	.2250	.....	
31,000	31,000	.2600	.....	
32,000	32,000	.2930	.....	
33,000	33,000	.3280	.....	
34,000	34,000	.37	.....	
35,000	35,000	.42	.....	
36,000	36,000	.48	.....	
37,000	37,000	.53	.....	
38,000	38,000	.59	.....	
39,000	39,000	.66	.....	
40,000	40,000	.74	.....	
41,000	41,000	.84	.....	
42,000	42,000	.98	.....	
43,000	43,000	1.12	.....	
44,000	44,000	1.40	.....	
44,050	44,050	1.50	.....	Tensile strength.
35,100	.....	.....	.....	Load at time of fracture.
0	0	1.88	.....	= 18.8 per cent.

Elongation of inch sections, ″.14, ″.14, ″.13, ″.13, ″.15, ″.13, ″.21, ″.53, ″.17, ″.15.
Diameter at fracture, ″.84. Area, .554 square inch.
Contraction, 44.6 per cent.
Fractured 4″.4 from neck, or 7½″ from end of axle.
Appearance, fibrous, seamy.

No. 813.

Marks, $^{MB_4}_{c_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0048	0.	
18,000	18,000	.0059	0.	
18,500	18,500	.0061	.....	
19,000	19,000	.0064	.....	
19,500	19,500	.0067	.....	
20,000	20,000	.0069	.0004	
20,500	20,500	.0073	.....	
21,000	21,000	.0077	.....	
21,500	21,500	.0079	.....	Elastic limit.
22,000	22,000	.0088	.....	
22,500	22,500	.0096	.....	
23,000	23,000	.0113	.....	
23,500	23,500	.0142	.....	
24,000	24,000	.0200	.....	
24,500	24,500	.0280	.....	
25,000	25,000	.0349	.0263	
26,000	26,000	.0478	.....	
27,000	27,000	.0737	.....	
28,000	28,000	.0990	.....	
29,000	29,000	.1200	.....	
30,000	30,000	.1558	.....	
31,000	31,000	.1910	.....	
32,000	32,000	.2150	.....	
33,000	33,000	.2495	.....	
34,000	34,000	.2900	.2782	
Sectional area called .97293 square inch.				
1,000	1,078	.2782	.....	
5,000	5,391	.2798	.....	E = 28,374,000.
10,000	10,782	.2817	.....	E = 26,955,000.
15,000	16,173	.2837	.....	E = 25,671,000.
20,000	21,564	.2858	.....	E = 25,671,000.
25,000	26,955	.2879	.....	E = 23,439,000.
30,000	32,346	.2902	.....	
25,000	26,955	.2884	.....	E = 29,950,000.
20,000	21,564	.2866	.....	E = 29,950,000.
15,000	16,173	.2846	.....	E = 26,955,000.
10,000	10,782	.2824	.....	E = 24,504,000.
5,000	5,391	.2803	.....	E = 25,671,000.
1,000	1,078	.2783	.....	E = 21,565,000.
35,000	35,000	.32	.....	
36,000	36,000	.39	.....	
37,000	37,000	.43	.....	
38,000	38,000	.49	.....	
39,000	39,000	.57	.....	
40,000	40,000	.62	.....	
41,000	41,000	.69	.....	
42,000	42,000	.80	.....	
43,000	43,000	.91	.....	
44,000	44,000	1.02	.....	
45,000	45,000	1.22	.....	
46,000	46,000	1.49	.....	
46,760	46,760	2.12	.....	Tensile strength.
42,000	.....	.....	.....	Load at time of fracture,
0	0	2.41	.....	= 24.1 per cent.

Elongation of inch sections, ″.20, ″.19, ″.21, ″.20, ″.28, *″.44, ″.27, ″.19, ″.20, ″.23.

Diameter at fracture, ″.92. Area, .665 square inch.

Contraction, 33.5 per cent.

Fractured at middle of stem or 11″ from end of axle. Appearance fibrous, 80 per cent.; granular, 20 per cent.; seamy, contains considerable cinder.

COMPLETION OF THE TEST OF AXLE SPECIMEN $^{MB}_{2c}$, AFTER A REST OF 1 YEAR AND 26 DAYS.

Following is a synopsis of the first test, the details of which are found in the Report of Tests for 1885, No. 1538:

Tensile strength, 47,120 pounds per square inch. Test discontinued when load had fallen to 44,000 pounds per square inch, with stretching still going on.

Total elongation, 1″.97 = 19.7 per cent.

Elongation of inch sections, *″.44, ″.25, ″.19, ″.18, ″.17, ″.16, ″.15, ″.14, ″.15, ″.14.

Diameter at contracted section, ″.93. Area, .679 square inch.

Contraction, 32.1 per cent.

Completion of test.

Tensile strength, 49,700 pounds = 49,700 pounds per square inch on original section, or 73,200 pounds per square inch on reduced section.

Load at time of fracture, 42,100 pounds.

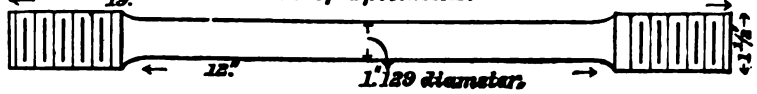
Bar fractured 1″.77 from the neck. The inch section in which fracture occurred elongated from ″.48 to ″.55, the diameter contracting to ″.85 = .567 square inch sectional area, a contraction of 43.3 per cent. from original size.

Other sections of the bar were not elongated any additional amount over the first test.

Appearance of fracture, fibrous.

TABULATION OF TENSILE TESTS OF SPECIMENS FROM MUCK-BAR AXLE NO. 4 AFTER THE AXLE HAD RUN 163,138 MILES.

Form of Specimens.



No. of test.	Marks.	Diameter.	Sectional area.	Elastic limit per square inch.	Ultimate strength per square inch.	Elongation in ten inches.	Area at fracture. Diameter.	Area at fracture. Area.	Contraction of area.	Appearance of fracture.	Location of fracture.
		Inches.	*Sq. inch.*	*Pounds.*	*Pounds.*	*Per cent.*	*Inch.*	*Sq. inch.*	*Per cent.*		
805	A1	1.129	1.00	20,000	45,420	23.1	.84	.554	44.6	Fibrous; seamy	6½" from end of axle.
806	B1	1.129	1.00	19,500	43,310	16.7	.87	.594	40.6	Fibrous; followed a seam 1½"	Do.
807	C1	1.129	1.00	20,000	45,290	21.8	.85	.567	43.3	Fibrous; considerable cinder present	6¾" from end of axle.
Averages.		.....	.....	19,833	44,673	20.5	.....	.....	42.8		
808	A2	1.129	1.00	25,000	46,440	24.1	.81	.515	48.5	Fibrous	5".4 from neck of specimen.
809	B2	1.129	1.00	24,500	46,100	25.3	.79	.490	51.0	.....do	5".85 from neck of specimen.
810	C2	1.129	1.00	26,500	47,730	22.9	.83	.541	45.9	.....do	5".25 from neck of specimen.
Averages.		.....	.....	25,377	46,756	24.1	.....	.....	48.5		
811	A3	1.129	1.00	21,000	45,370	22.0	.95	.709	29.1	Fibrous	11⅛" from end of axle.
812	B3	1.129	1.00	20,000	44,050	18.8	.84	.554	44.6	Fibrous; seamy	7⅛" from end of axle.
813	C3	1.129	1.00	21,500	46,760	24.1	.92	.665	33.5	Fibrous, 80 per cent.; granular, 20 per cent.; seamy; contains considerable cinder.	11" from end of axle.
Averages.		.....	.....	20,833	45,393	21.6	.....	.....	35.7		

Modulus of elasticity (average of the nine specimens between loads 5,000 and 20,000 pounds per square inch), 28,846,000 pounds.

STEEL BARS.

TEMPERATURE SERIES.

COMPRESSION TESTS OF THE METAL, AND OBSERVATIONS ON THE MODULUS OF ELASTICITY UNDER BOTH TENSILE AND COMPRESSIVE STRESSES

Ten grades of open-hearth steel are here represented, in which the carbon ranges from .09 to .97 per cent., varying by tenths of a per cent. as nearly as was practicable to obtain the steel. The other elements do not follow any regular succession.

The bars were rolled to 1¼″ diameter, and turned to specimens from that size.

The steel was made by the Norway Steel and Iron Works, South Boston, Mass., and the chemical analyses furnished by George H. Billings, superintendent.

These bars are intended to furnish part of the material for use in a comprehensive series of tests at higher temperatures.

The compression tests show that bars of the proportions here employed fail by flexure soon after passing the elastic limit of the metal.

The two limits, elastic and ultimate, are very close together in the milder grades of metal, and diverge somewhat in the harder steel.

The modulus of elasticity in compression averages higher than in tension, and appears less regular under the former stress than the latter.

In the case of the tension bars, which afforded the best opportunities for accurate measurements, it is at least evident that the modulus of elasticity is not far from 30,000,000 pounds, whether the steel contains .1 per cent. or 1.00 per cent. of carbon, other elements at the same time being present.

In the details asterisks indicate between what loads the modulus of elasticity was computed.

No. 787.

Marks, $\frac{3}{782}$
C., .31. Mn., .57.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0015	0.	*
8,000	10,000	.0030	0.	
12,000	15,000	.0048	.0001	
16,000	20,000	.0064	.0001	
20,000	25,000	.0080	.0001	
24,000	30,000	.0098	.0001	
28,000	35,000	.0114	.0001	* E., 30,612,200.
28,800	36,000	.0118	.....	
29,600	37,000	.0121	.....	
30,400	38,000	.0125	.....	
31,200	39,000	.0128	.....	
32,000	40,000	.0130	.....	
32,800	41,000	.0134	.....	
33,600	42,000	.0137	.....	
34,400	43,000	.0140	.....	
35,200	44,000	.0145	.....	
35,600	44,500	.0147	.....	Elastic limit.
36,000	45,000	.0218	.....	
36,400	45,500	.06	.....	Ultimate strength.

Failed by triple flexure.

No. 788.

Marks, $\frac{4}{795}$
C., .37. Mn., .70.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0015	.0001	*
8,000	10,000	.0030	.0001	
12,000	15,000	.0048	.0001	
16,000	20,000	.0065	.0002	
20,000	25,000	.0080	.0003	
24,000	30,000	.0098	.0004	
28,000	35,000	.0114	.0005	
32,000	40,000	.0133	.0005	
36,000	45,000	.0148	.0006	* E., 31,250,000.
36,800	46,000	.0155	.....	
37,600	47,000	.0160	.....	Elastic limit.
38,000	47,500	.06	.....	
40,700	50,875	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 790.

Marks, $\frac{6}{797}$
C., .57. Mn., .93. Si., .07.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0013	0.	
8,000	10,000	.0030	0.	
12,000	15,000	.0048	0.	
16,000	20,000	.0063	0.	
20,000	25,000	.0080	0.	
24,000	30,000	.0097	0.	
28,000	35,000	.0113	0.	
32,000	40,000	.0131	.0001	
36,000	45,000	.0147	.0002	
40,000	50,000	.0164	.0002	* E., 30,201,000.
40,800	51,000	.0168	.....	
41,600	52,000	.0171	.....	
42,400	53,000	.0175	.....	
43,200	54,000	.0179	.....	
44,000	55,000	.0182	.....	
44,400	55,500	.0184	.....	Elastic limit.
44,800	56,000	.0191	.....	
45,200	56,500	.0201	.....	
45,600	57,000	.0219	.....	
46,400	58,000	.0410	.....	
52,400	65,500	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 792.

Marks, $\frac{8}{750}$
C., .81. Mn., .56. Si., .17.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0013	0.	*
8,000	10,000	.0031	0.	
12,000	15,000	.0047	0.	
16,000	20,000	.0064	0.	
20,000	25,000	.0081	0.	
24,000	30,000	.0097	0.	
28,000	35,000	.0114	0.	
32,000	40,000	.0131	0.	
36,000	45,000	.0148	.0001	
40,000	50,000	.0164	.0001	* E., 30,000,000.
44,000	55,000	.0181	.....	
48,000	60,000	.0200	.....	
52,000	65,000	.0217	.....	
52,800	66,000	.0221	.....	
53,600	67,000	.0225	.....	
54,400	68,000	.0228	.....	
55,200	69,000	.0232	.....	
56,000	70,000	.0236	.0005	
56,800	71,000	.0240	.....	
57,600	72,000	.0243	.....	
58,400	73,000	.0248	.....	
59,200	74,000	.0252	.....	
59,600	74,500	.0254	.....	Elastic limit.
60,000	75,000	.0261	.....	
60,400	75,500	.0264	.....	
60,800	76,000	.0277	.....	
61,200	76,500	.0296	.....	
61,600	77,000	.0338	.....	
62,400	78,000	.0400	.....	
63,200	79,000	.0444	.....	
64,000	80,000	.0485	.....	
70,200	87,750	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 794.

Marks, $\frac{10}{334}$
C., .97. Mn., .80. Si., .28.
Length, 12″.
Diameter, 1.″0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0015	0.	*
8,000	10,000	.0031	0.	
12,000	15,000	.0049	.0001	
16,000	20,000	.0065	.0001	
20,000	25,000	.0081	.0001	
24,000	30,000	.0097	.0001	
28,000	35,000	.0113	.0001	
32,000	40,000	.0129	.0002	
36,000	45,000	.0146	.0002	
40,000	50,000	.0163	.0002	* E., 30,822,000.
44,000	55,000	.0181	.0002	
48,000	60,000	.0197	.0002	
52,000	65,000	.0215	.0002	
56,000	70,000	.0230	.....	
56,800	71,000	.0234	.....	
57,600	72,000	.0237	.....	
58,400	73,000	.0241	.....	
59,200	74,000	.0245	.....	
60,000	75,000	.0250	.....	
60,800	76,000	.0253	.....	
61,600	77,000	.0256	.....	
62,400	78,000	.0260	.....	
63,200	79,000	.0263	.....	
64,000	80,000	.0267	.....	
64,800	81,000	.0271	.....	
65,600	82,000	.0276	.....	
66,400	83,000	.0281	.....	Elastic limit.
66,800	83,500	.0288	.....	
67,200	84,000	.0398	.....	
67,600	84,500	.0428	.....	
68,000	85,000	.0445	.....	
68,800	86,000	.0468	.....	
69,600	87,000	.0502	.....	
70,400	88,000	.0534	.....	
71,200	89,000	.0596	.....	
73,200	91,500	.....	.....	Ultimate strength.

Failed by triple flexure.

DETAILS OF TENSION TESTS.

No. 753.

Marks, $\frac{1}{833}$
C., .09. Mn., .11.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0019	.....	
3,200	4,000	.0029	.....	
4,000	5,000	.0039	0.	
4,800	6,000	.0049	.....	
5,600	7,000	.0059	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0089	.0001	
8,800	11,000	.0100	.....	
9,600	12,000	.0110	.....	
10,400	13,000	.0120	.....	
11,200	14,000	.0130	.....	
12,000	15,000	.0140	.0002	
12,800	16,000	.0151	.....	
13,600	17,000	.0161	.....	
14,400	18,000	.0171	.....	
15,200	19,000	.0181	.....	
16,000	20,000	.0191	.....	
16,800	21,000	.0202	.0003	*E., 30,151,000.
4,000	5,000	.0043	.....	
8,000	10,000	.0093	.....	
12,000	15,000	.0142	.....	
16,800	21,000	.0202	.0004	
16,800	21,000	.0202	.0004	

No. 754.

Marks, $\frac{2}{123}$
C., .20. Mn., .45.
Diameter, 1.″0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
.800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0029	.....	
4,000	5,000	.0039	0.	
4,800	6,000	.0049	.....	
5,600	7,000	.0060	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0090	.0001	
8,800	11,000	.0100	.....	
9,600	12,000	.0110	.....	
10,400	13,000	.0120	.....	
11,200	14,000	.0130	.....	
12,000	15,000	.0140	.0001	
12,800	16,000	.0149	.....	
13,600	17,000	.0160	.....	
14,400	18,000	.0170	.....	
15,200	19,000	.0180	.....	
16,000	20,000	.0190	.....	
16,800	21,000	.0200	.0001	* E, 30,151,000.
16,800	21,000	.0200	.....	
17,600	22,000	.0210	.....	
18,400	23,000	.0220	.....	
19,200	24,000	.0230	.....	
20,000	25,000	.0240	.0001	

No. 755.

Marks, $\frac{3}{782}$
C., .31. Mn., .57.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0011	.....	
2,400	3,000	.0021	.....	
3,200	4,000	.0031	.....	
4,000	5,000	.0042	.0002	
4,800	6,000	.0052	.....	
5,600	7,000	.0062	.....	
6,400	8,000	.0074	.....	
7,200	9,000	.0084	.....	
8,000	10,000	.0094	.0005	
8,800	11,000	.0104	.....	
9,600	12,000	.0114	.....	
10,400	13,000	.0125	.....	
11,200	14,000	.0135	.....	
12,000	15,000	.0145	.0006	
12,800	16,000	.0155	.....	
13,600	17,000	.0166	.....	
14,400	18,000	.0176	.....	
15,200	19,000	.0187	.....	
16,000	20,000	.0197	.....	
16,800	21,000	.0208	.0008	* E., 30,000,000.
17,600	22,000	.0218	.....	
18,400	23,000	.0228	.....	
19,200	24,000	.0238	.....	
20,000	25,000	.0248	.0009	

No. 756.

Marks, $\frac{4}{795}$
C., .37. Mn., .70.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.0001	
4,000	5,000	.0050	.....	
4,800	6,000	.0060	.....	
5,600	7,000	.0070	.....	
6,400	8,000	.0081	.....	
7,200	9,000	.0090	.0002	
8,000	10,000	.0102	.....	
8,800	11,000	.0112	.....	
9,600	12,000	.0122	.....	
10,400	13,000	.0132	.....	
11,200	14,000	.0142	.0003	
12,000	15,000	.0142	.0003	
12,800	16,000	.0152	.....	
13,600	17,000	.0162	.....	
14,400	18,000	.0172	.....	
15,200	19,000	.0183	.....	
16,000	20,000	.0193	.....	
16,800	21,000	.0203	.0004	* E., 30,151,000.
17,600	22,000	.0215	.....	
18,400	23,000	.0225	.....	
19,200	24,000	.0235	.....	
20,000	25,000	.0245	.0005	

No. 757.

Marks, $\frac{5}{803}$
C., .51. Mn., .58. Si., .02.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.....	
4,000	5,000	.0040	.0001	
4,800	6,000	.0050	.....	
5,600	7,000	.0061	.....	
6,400	8,000	.0071	.....	
7,200	9,000	.....	.....	
8,000	10,000	.0090	.0001	
8,800	11,000	.....	.....	
9,600	12,000	.0109	.....	
10,400	13,000	.....	.....	
11,200	14,000	.0130	.....	
12,000	15,000	.0140	.0001	
12,800	16,000	.0150	.....	
13,600	17,000	.....	.....	
14,400	18,000	.0170	.....	
15,200	19,000	.....	.....	
16,000	20,000	.0190	.....	
16,800	21,000	.0200	.0001	
17,600	22,000	.0211	.....	
19,200	24,000	.0221	.....	
20,000	25,000	.0241	.0001	
20,800	26,000	.0251	.....	
22,400	28,000	.0271	.....	
24,000	30,000	.0291	.0001	*E., 30,000,000.

No. 758.

Marks, $^{6}_{797}$
C., .57. Mn., .93. Si., .07.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30.″

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.....	
4,000	5,000	.0040	0.	
4,800	6,000	.0050	.....	
5,600	7,000	.0060	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0090	0.	
12,000	15,000	.0140	0.	
16,000	20,000	.0190	.0001	
16,800	21,000	.0200	.0001	
20,000	25,000	.0240	.0001	
20,800	26,000	.0250	.....	
21,600	27,000	.0260	.....	
22,400	28,000	.0270	.....	
23,200	29,000	.0280	.....	
24,000	30,000	.0290	.0001	*E., 30,104,000.

No. 759.

Marks, $^{7}_{823}$
C., .71. Mn., .58. Si., .08.
Diameter, 1.″0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0029	.....	
4,000	5,000	.0039	0.	
4,800	6,000	.0049	.....	
5,600	7,000	.0059	.....	
6,400	8,000	.0069	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0090	0.	
12,000	15,000	.0140	0.	
16,000	20,000	.0190	.....	
16,800	21,000	.0200	0.	
20,000	25,000	.0240	.0001	
24,000	30,000	.0290	.0001	
24,800	31,000	.0300	.....	
25,600	32,000	.0310	.....	
26,400	33,000	.0320	.....	
27,200	34,000	.0330	.....	
28,000	35,000	.0340	.0001	*E., 30,088,000.

No. 760.

Marks, $\frac{8}{750}$
C., .81. Mn., .56. Si., .17.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.....	
4,000	5,000	.0040	0.	
4,800	6,000	.0049	.....	
5,600	7,000	.0059	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0090	0.	
12,000	15,000	.0139	0.	
16,000	20,000	.0191	.....	
16,800	21,000	.0201	—.0001	
20,000	25,000	.0239	—.0001	
24,000	30,000	.0289	—.0001	
28,000	35,000	.0339	—.0001	
28,800	36,000	.0349	.....	
29,600	37,000	.0359	.....	
30,400	38,000	.0369	.....	
31,200	39,000	.0380	.....	
32,000	40,000	.0391	—.0001	
32,000	40,000	.0390	—.0001	*E., 29,923,000.

No. 761.

Marks, $\frac{9}{756}$
C., .89. Mn., .57. Si., .19.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.....	
4,000	5,000	.0040	0.	
4,800	6,000	.0050	.....	
5,600	7,000	.0060	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0081	.....	
8,000	10,000	.0091	.0001	
12,000	15,000	.0141	.0001	
16,000	20,000	.0192	.....	
16,800	21,000	.0202	.0002	
20,000	25,000	.0242	.0002	
24,000	30,000	.0292	.0002	
28,000	35,000	.0342	.0003	
32,000	40,000	.0393	.0003	
32,800	41,000	.0404	.....	
33,600	42,000	.0414	.....	
34,400	43,000	.0424	.....	
35,200	44,000	.0436	.....	
36,000	45,000	.0445	.0003	
36,000	45,000	.0446	.0004	*E., 29,864,000.
36,000	45,000	.0446	.....	
32,000	40,000	.0395	.....	
28,000	35,000	.0345	.....	
24,000	30,000	.0295	.....	
20,000	25,000	.0245	.....	
16,000	20,000	.0195	.....	
12,000	15,000	.0145	.....	
8,000	10,000	.0095	.....	
4,000	5,000	.0044	.....	
800	1,000	.0004	.....	

No. 762.

Marks, $\frac{10}{334}$
C., .97. Mn., .80 Si., .28.
Diameter, 1″.0092
Sectional area, .80 square nch.
Gauged length. 3t

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0009	.....	
2,400	3,000	.0018	.....	
3,200	4,000	.0028	.....	
4,000	5,000	.0037	0.	
4,800	6,000	.0047	.....	
5,600	7,000	.0057	.....	
6,400	8,000	.0067	.....	
7,200	9,000	.0078	.....	
8,000	10,000	.0088	0.	
12,000	15,000	.0138	0.	
16,000	20,000	.0190	.....	
16,800	21,000	.0201	0.	
20,000	25,000	.0240	0.	
24,000	30,000	.0290	0.	
28,000	35,000	.0341	.0002	
32,000	40,000	.0393	.0003	
36,000	45,000	.0447	.0003	
36,800	46,000	.0457	.....	
37,600	47,000	.0467	.....	
38,400	48,000	.0477	.....	
39,200	49,000	.0487	.....	
40,000	50,000	.0497	.0004	* E., 29,817,000.
40,000	50,000	.0497	.....	
36,000	45,000	.0448	.....	
32,000	40,000	.0396	.....	
28,000	35,000	.0346	.....	
24,000	30,000	.0296	.....	
20,000	25,000	.0247	.....	
16,000	20,000	.0198	.....	
12,000	15,000	.0145	.....	
8,000	10,000	.0095	.....	
4,000	5,000	.0044	.....	
800	1,000	.0005	.....	Rested 1 hour.
800	1,000	.0008	.....	
4,000	5,000	.0047	.....	
8,000	10,000	.0097	.....	
12,000	15,000	.0148	.....	
16,000	20,000	.0200	.....	
20,000	25,000	.0248	.....	
24,000	30,000	.0298	.....	
28,000	35,000	.0348	.....	
32,000	40,000	.0398	.....	
36,000	45,000	.0450	.....	
40,000	50,000	.0500	.....	
36,000	45,000	.0452	.....	
32,000	40,000	.0400	.....	
28,000	35,000	.0350	.....	
24,000	30,000	.0299	.....	
20,000	25,000	.0249	.....	
16,000	20,000	.0200	.....	
12,000	15,000	.0149	.....	
8,000	10,000	.0098	.....	
4,000	5,000	.0048	.....	
800	1,000	.0008	.....	

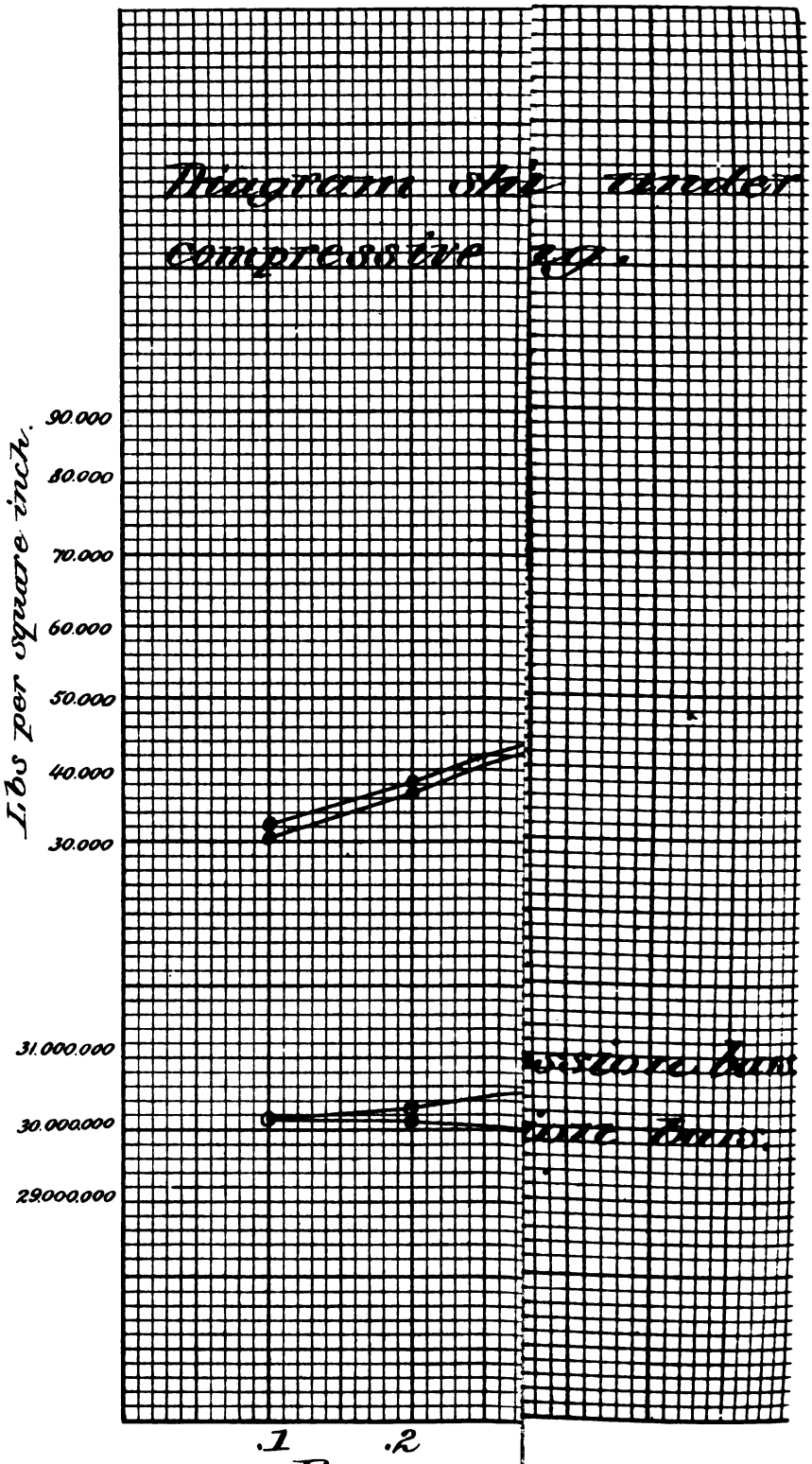


Diagram showing tender
compressive eq.
Lbs per square inch.
90.000
80.000
70.000
60.000
50.000
40.000
30.000
31.000.000
30.000.000
29.000.000
.1
.2
Per cent
Ex 31 492

TABULATION OF STEEL BARS.—TEMPERATURE SERIES.

Chemical analysis.			Compression tests.								Tension tests.	
Carbon.	Manganese.	Silicon.	No. of test.	Length.	Diameter.	Sectional area.	Elastic limit per square inch.	Ultimate strength per square inch.	Modulus of elasticity per square inch.	Manner of failure.	No. of test.	Modulus of elasticity per square inch.
Per ct.	*Per cent.*	*Per cent.*		*Inches.*	*Inches.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*			*Pounds.*
.09	.11	.....	785	12	1.0092	.80	30,500	32,125	30,120,000	Triple flexure	753	30,151,000
.20	.45	.....	786	12	1.0092	.80	37,000	39,190	30,303,000	do	754	30,151,000
.31	.57	.....	787	12	1.0092	.80	44,500	45,500	30,612,000	do	755	30,000,000
.37	.70	.....	788	12	1.0092	.80	47,000	50,875	31,250,000	do	756	30,151,000
.51	.58	.02	789	12	1.0092	.80	57,000	58,000	30,075,000	do	757	30,000,000
.57	.93	.07	790	12	1.0092	.80	55,500	65,500	30,201,000	do	758	30,104,000
.71	.58	.08	791	12	1.0092	.80	55,500	65,440	31,034,000	do	759	30,088,000
.81	.56	.17	792	12	1.0092	.80	74,500	87,750	30,000,000	do	760	29,923,000
.89	.57	.19	793	12	1.0092	.80	76,500	84,125	30,612,000	do	761	29,864,000
.97	.80	.28	794	12	1.0092	.80	83,000	91,500	30,822,000	do	762	29,817,000

RE-TESTS OF WROUGHT-IRON BARS.

The object in re-testing these bars was to determine the present m ulus of elasticity of the metal after their previous straining, and le the effects of annealing.

The specimens were turned down to 1″.129 diameter from their rou surfaces, which were 2″ diameter before the original tests were mad

Elongations were measured along three lines, 120° apart, on the lindrical surface of the stem, measuring the elongations on one line a time, the specimen being rotated through 120° each time, so as bring the measured line on the upper surface in the testing machine

Specimens from the same bar show very nearly the same modulu elasticity.

The annealed specimens were shortened by that process, confirm the results obtained with specific gravity specimens, which showed density of overstrained steel was increased by annealing.

Specimen No. 694 was considerably warped by the annealing. 693 was left very nearly straight.

Comparing the modulus of elasticity of the latter bar at differ stages, it is seen that annealing effects a reduction which the bar p tially recovers from, after the lapse of time; thus the modulus of el ticity was—

Before annealing	27,9[illegible],
After annealing	26,9[illegible],
Reduction	1,0[illegible],
After annealing and a rest of 24 days	27,3[illegible],
Recovery	3[illegible],

These differences are not large, yet such as they are they show a c formity in behavior of the annealed metal with the overstrained i and steel eye-bars.

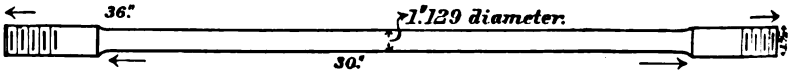
SPECIMENS FROM FRACTURED END OF DOUBLE-REFINED BAR L 2

[Original test made May 24, 1882. No. 604, Report of Tests, 1882.]

Synopsis of original test.

Ultimate strength, 50,188 pounds per square inch.
Elongation in 80 inches, 19.9 per cent.
Contraction of area, 43 per cent.

Form of Specimens.



Elongations measured on the gauged lengths of 30″ along three line A, B, and C.

No. 690.

FIRST SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
6,000	.0010	.0010	.0010	.00100	
7,000	.0021	.0021	.0020	.00207	
8,000	.0032	.0032	.0030	.00313	
9,000	.0043	.0042	.0041	.00420	
10,000	.0054	.0053	.0052	.00530	
12,000	.0075	.0075	.0075	.00750	
14,000	.0097	.0096	.0096	.00963	
15,000	.0108	.0108	.0107	.01077	
16,000	.0119	.0118	.0118	.01183	
18,000	.0141	.0141	.0140	.01407	
20,000	.0163	.0161	.0162	.01620	
22,000	.0185	.0185	.0183	.01843	
24,000	.0207	.0206	.0205	.02060	
25,000	.0219	.0217	.0217	.02177	
5,000	.0000	.0001	.0001	.00007	
10,000	.0054	.0055	.0055	.00547	
15,000	.0109	.0110	.0110	.01097	
20,000	.0165	.0164	.0164	.01643	
25,000	.0219	.0218	.0218	.02183	
5,000	.0000	.0001	.0001	.00007	
10,000	.0055	.0055	.0054	.00547	
15,000	.0109	.0110	.0109	.01093	
20,000	.0164	.0163	.0164	.01637	
25,000	.0220	.0218	.0217	.02183	E., 27,612,000.
5,000	.0001	.0001	.0001	.00010	

No. 694.

SECOND SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0055	.0055	.0053	.00543	
15,000	.0110	.0109	.0110	.01097	
20,000	.0165	.0164	.0164	.01643	
25,000	.0220	.0219	.0219	.02193	
5,000	.0001	.0001	.0002	.00013	
10,000	.0056	.0054	.0056	.00553	
15,000	.0110	.0111	.0110	.01103	
20,000	.0166	.0164	.0165	.01650	
25,000	.0220	.0219	.0220	.02197	
5,000	.0000	.0000	.0002	.00007	
10,000	.0057	.0054	.0056	.00557	
15,000	.0111	.0110	.0111	.01107	
20,000	.0166	.0164	.0165	.01650	
25,000	.0220	.0219	.0220	.02197	E=27,523,000.
5,000	.0001	.0002	.0002	.00017	

Bar heated dull red in a forge fire and cooled in the open air. Th annealing shortened the bar, measured on the gauged length, as follow Lines A, —″.0004; B, —″.0015; C, +″.0071; average shortening: ″.0017⅓.

In heating and cooling this bar was considerably warped, hen although there is an average permanent shortening as a whole, yet alon lines A and B there is an apparent lengthening, due to the warping the bar.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inches.*	*Inch.*	
5,000	0.	.....	.....	.....	Initial load.
10,000	.0057	.....	.....	.....	
15,000	.0117	.....	.....	.....	
20,000	.0185	.....	.....	.....	
25,000	.0298	.....	.....	.....	
5,000	.0073	.....	.....	.....	
5,000	0.	0.	0.	.....	Micrometer reset to zero after first loading.
10,000	.0055	.0056	.0057	.00560	
15,000	.0112	.0113	.0115	.01133	
20,000	.0169	.0170	.0174	.01710	
5,000	—.0001	.0001	.0001	.00003	
10,000	.0055	.0058	.0059	.00573	
15,000	.0112	.0115	.0117	.01147	
20,000	.0169	.0172	.0173	.01720	E=26,424,000.
5,000	.0000	.0003	.0002	.00017	
Bar again examined after a period of rest of 24 days after annealing.					
5,000	0.	0.	0.	0.	Initial load.
10,000	.0057	.0056	.0059	.00573	
15,000	.0115	.0113	.0116	.01147	
20,000	.0171	.0170	.0174	.01717	
5,000	.0003	.0002	.0003	.00027	
10,000	.0059	.0056	.0059	.00580	
15,000	.0117	.0114	.0117	.01130	

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inches.*	*Inch.*	
20,000	.0173	.0170	.0174	.01723	E=26,533,000.
5,000	.0003	.0003	.0002	.00027	
.....	.....	.....	.0001	.....	After 5 minutes' rest.
25,000	.....	.....	.0233	.....	
26,000	.....	.....	.0247	.....	
27,000	.....	.....	.0258	.....	
28,000	.....	.....	.0270	.....	
29,000	.....	.....	.0282	.....	
30,000	.....	.....	.0293	.....	
5,000	.....	.....	.0009	.....	
31,000	.....	.....	.0311	.....	Elastic limit.
32,000	.....	.....	.0392	.....	
28,000	.....	.....	.2510	.....	
29,000	.....	.....	.3700	.....	
30,000	.....	.....	.4015	.....	
31,000	.....	.....	.4250	.....	
32,000	.....	.....	.4490	.....	
33,000	.....	.....	.4900	.....	
34,000	.....	.....	.6245	.....	
35,000	.....	.....	.7110	.....	
36,000	.....	.....	.74	.....	
37,000	.....	.....	.85	.....	
38,000	.....	.....	.93	.....	
39,000	.....	.....	1.04	.....	
40,000	.....	.....	1.10	.....	
41,000	.....	.....	1.27	.....	
42,000	.....	.....	1.44	.....	
43,000	.....	.....	1.52	.....	
44,000	.....	.....	1.72	.....	
45,000	.....	.....	1.94	.....	
46,000	.....	.....	2.16	.....	
0	.....	.....	.....	.....	Rested 3 minutes.
47,000	.....	.....	2.20	.....	
48,000	.....	.....	2.62	.....	
49,000	.....	.....	2.84	.....	
50,000	.....	.....	3.40	.....	
51,000	.....	.....	3.82	.....	
52,000	.....	.....	4.80	.....	
52,400	.....	.....	5.65	.....	Tensile strength.
49,800	.....	.....	.....	.....	Load at time of rupture.

Total elongation in 30 inches, 19.7 per cent.
Diameter at fracture, ″.92. Area, .665 square inch.
Contraction, 33.5 per cent.
Fractured 9″ from neck. Appearance, fibrous 100 per cent.

SPECIMENS FROM FRACTURED END OF DOUBLE-REFINED BAR S 218.

[Original test made May 22, 1882. No. 596, Report of Tests, 1882.]

Synopsis of original test.

Ultimate strength, 50,631 pounds per square inch.
Elastic limit, 24,610 pounds per square inch.
Elongation in 80 inches, 20.4 per cent.
Contraction of area, 41 per cent.

No. 691.

FIRST SPECIMEN.

(Same form as specimens from bar L 210.)

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0053	.0053	.0053	.00530	
15,000	.0106	.0107	.0107	.01067	
20,000	.0160	.0160	.0161	.01603	
25,000	.0214	.0213	.0215	.02140	
5,000	.0000	.0000	.0001	.00003	
10,000	.0052	.0053	.0055	.00533	
15,000	.0106	.0107	.0109	.01073	
20,000	.0159	.0160	.0162	.01603	
25,000	.0214	.0215	.0216	.02150	
5,000	—.0001	.0000	.0000	—.00003	
10,000	.0052	.0053	.0055	.00533	
15,000	.0106	.0108	.0108	.01073	
20,000	.0159	.0161	.0162	.01607	
25,000	.0214	.0214	.0216	.02147	E=27,907,000.
5,000	—.0001	.0000	.0000	—.00003	

No. 692.

SECOND SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0053	.0053	.0053	.00530	
15,000	.0108	.0107	.0107	.01073	
20,000	.0162	.0160	.0161	.01610	
25,000	.0216	.0214	.0214	.02147	
5,000	.0002	.0000	—.0001	.00003	
10,000	.0055	.0053	.0053	.00537	
15,000	.0109	.0107	.0107	.01077	
20,000	.0162	.0162	.0160	.01613	
25,000	.0216	.0215	.0214	.02150	
5,000	.0002	.0000	—.0001	.00003	
10,000	.0055	.0055	.0054	.00547	
15,000	.0109	.0107	.0107	.01077	
20,000	.0163	.0160	.0160	.01610	
25,000	.0216	.0214	.0214	.02147	E = 28,037,000.
5,000	.0003	.0000	—.0001	.00007	

No. 693.

THIRD SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0054	.0053	.0054	.00537	
15,000	.0108	.0106	.0108	.01073	
20,000	.0163	.0161	.0162	.01620	
25,000	.0216	.0214	.0216	.02153	
5,000	.0000	.0000	.0001	.00003	
10,000	.0055	.0054	.0055	.00547	
15,000	.0109	.0108	.0108	.01082	
20,000	.0163	.0162	.0162	.01623	
25,000	.0217	.0215	.0216	.02160	
5,000	.0002	.0001	.0002	.00017	
10,000	.0056	.0054	.0055	.00550	
15,000	.0110	.0108	.0108	.01087	
20,000	.0164	.0162	.0162	.01627	
25,000	.0218	.0215	.0216	.02163	E = 27,998,000.
5,000	.0003	.0001	.0002	.00020	

Bar heated dull red in a forge fire and cooled in the open air. This annealing shortened the bar, measured on the gauged length, as follows: Lines A, ″.0016; B, ″.0019; C, ″.0011; average, ″.0015¼.

(Observations repeated on the modulus of elasticity.)

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	.....	.....	.....	Initial load.
10,000	.0057	.....	.....	.....	
15,000	.0114	.....	.....	.....	
20,000	.0177	.....	.....	.....	
25,000	.0278	.....	.....	.....	
5,000	.0055	.....	.....	.....	
5,000	.0000	0.	0.	0.	Micrometer reset to zero after first loading.
10,000	.0055	.0055	.0056	.00553	
15,000	.0110	.0110	.0113	.01110	
20,000	.0167	.0166	.0168	.01670	
5,000	0.	0.	.0002	.00007	
10,000	.0055	.0055	.0059	.00563	
15,000	.0111	.0110	.0115	.01120	
20,000	.0167	.0166	.0170	.01677	E = 26,995,000.
5,000	0.	0.	.0003	.00010	
Bar again examined after a rest of 24 days, after annealing.					
5,000	0.	0.	0.	0.	Initial load
10,000	.0056	.0056	.0054	.00553	
15,000	.0111	.0112	.0111	.01113	
20,000	.0167	.0165	.0165	.01657	
5,000	.0001	.0002	.0002	.00017	
10,000	.0057	.0056	.0056	.00563	
15,000	.0113	.0112	.0111	.01120	
20,000	.0168	.0168	.0165	.01670	E = 27,322,000.
5,000	.0002	.0002	.0003	.00023	

CUBIC COMPRESSION OF VARIOUS METALS AND WOOD.

1661

CUBIC COMPRESSION OF VARIOUS METALS AND WOOD.

Specimens of the same kind of metal were taken from the same bar, excepting the cast-irons.

The cast specimens of tin and lead were from the same ladles of molten metal.

Tests by tensile and compressive stresses were made with both uncompressed and cubic compressed specimens.

The cubic compressed specimens were subjected to an estimated hydrostatic pressure of 90,000 pounds per square inch; one steel specimen was compressed with 117,600 pounds per square inch.

The specimens when compressed were immersed in water in the bore of the steel cylinder, the dimensions of which were 10″ long, 6″ diameter outside, and ″.806 diameter of bore.

The effect of compression on the dimensions of the specimens was not appreciable with the steel, brass, and copper. The wrought-iron and cast specimens were smaller, and as the reduction in dimensions did not take place uniformly, the effect was attributed to closing interstices formed by blow-holes or the presence of cinder.

The water seemed to pass freely through the white pine, and the wood came out of the cylinder water-soaked and larger than when it went in.

There was not the same free penetration in the white oak; the middle part of its length was reduced in diameter, the greater reduction occurring in the direction parallel to the annual rings of growth.

A comparison of the results shows no appreciable change in the strength, elasticity, and ductility of the compressed over the uncompressed metal, except in the case of the lead, but as these specimens were cast from old bullets which contained impurities perhaps not uniformly distributed, it is not conclusive that cubic compression changed the properties of this metal.

Measurements of specimens before and after compressing with an estimated hydrostatic pressure of 90,000 pounds per square inch.

Diameter of bore of cylinder, ".806. Sectional area, .5102 square inch (90,000 × .5102) + 2,750 allowance for packing friction = 48,668 pounds, total load applied to piston.

No. of test.	Marks.	Material.	Applied pressure per square inch.	Before compression.		After compression.	
				Length.	Diameter.	Length.	Diameter.
			Pounds.	*Inches.*	*Inch.*	*Inches.*	*Inch.*
727	.....	Brass (drawn).....	90,000	5.507	.7500	5.507	.7500
728	1	Wrought iron.....	90,000	5.511	.7500	5.510	.7492
729	2	.....do.....	90,000	5.510	.7500	5.510	.7498
730	3	O. H. steel.....	90,000	5.504	.7502	5.504	.7502
731	4	.....do.....	117,600	5.509	.7998	5.510	.7998
732	1	Copper (drawn)	90,000	5.505	.7501	5.505	.7501
733	2	.....do.....	90,000	5.510	.7501	5.510	.7501
734†	1	Tin	90,000	5.505	.7504	5.505	.7504
735	2	.....do.....	90,000	5.497	.7503	5.497	.7502
736	1	Lead	90,000	5.509	.7500	5.509	.7500
737	2	.....do.....	90,000	5.501	.7492	5.502	.7491
738	12 T C5	Cast-iron (gun).....	90,000	5.437	.7497	5.434+	.7494
739‡	12 T C4	.....do.....	89,000	5.484	.7500	5.482	.7494
740§	1	White pine	84,900	5.506	.743	5.512	.755 .765
741‖	2	.....do.....	84,900	5.505	.747	5.533	.760
742	.....	White oak	90,000	5.522	.740	5.522	.....
743	10%	Aluminum bronze.....	90,000	5.50 +	.6715 .8014	No decided change.	
744	1	Zinc	90,000	5.501	.7502	5.499	.7500
745	2	.....do.....	90,000	5.502	.7500	5.502	.7499

* Bars found irregular in diameter after compressing, varying from ".0002 to ".0003.

† Showed no change in maximum dimensions; there were small local depressions, mere dots, in the cylindrical surface, and one spot, ".5 × ".4, which was depressed about ".004.

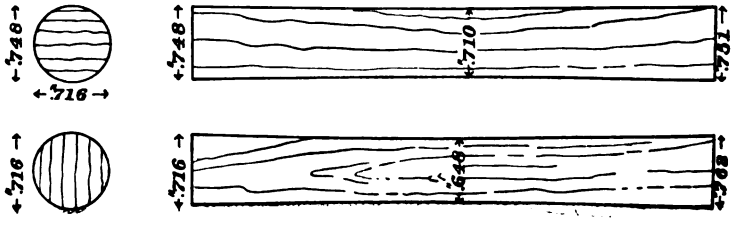
‡ Specimen was incased in thin brass, ".015 thick, in order to subject the metal to compression without allowing the water to enter the interstices of the casting.

§ Water exudes from ends and cylindrical surface after removal from water cylinder.

‖ Specimen compressed in liquid colored with cochineal, which showed the complete penetration of the liquid into the wood.

¶ A few small local depressions in cylindrical surfaces after about ".01 diameter.

Shape of white-oak cylinder after compressing.



DETAILS OF TENSION TESTS.

No. 703.

No. 1.—*Mild steel, uncompressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0004	0.	
2,000	10,000	.0010	0.	
3,000	15,000	.0015	0.	
4,000	20,000	.0020	0.	
5,000	25,000	.0025	0.	
6,000	30,000	.0031	.....	
7,000	35,000	.0036	.....	
7,200	36,000	.0038	.....	
7,400	37,000	.0039	.....	
7,600	38,000	.0039	.....	
7,800	39,000	.0040	.....	
8,000	40,000	.0041	.....	
8,200	41,000	.0042	.....	
8,400	42,000	.0043	.....	
8,600	43,000	.0044	.....	
8,800	44,000	.0046	.....	Elastic limit.
9,000	45,000	.0825	.....	
9,200	46,000	.0867	.....	
9,400	47,000	.0907	.....	
9,600	48,000	.0970	.....	
9,800	49,000	.1046	.....	
10,000	50,000	.1120	.....	
10,200	51,000	.1187	.....	
10,400	52,000	.1265	.....	
10,600	53,000	.1340	.....	
10,800	54,000	.1440	.....	
11,000	55,000	.1541	.....	
11,200	56,000	.1650	.....	
11,400	57,000	.1780	.....	
11,600	58,000	.19	.....	
11,800	59,000	.21	.....	
12,000	60,000	.23	.....	
12,200	61,000	.25	.....	
12,400	62,000	.28	.....	
12,600	63,000	.30	.....	
12,800	64,000	.35	.....	
13,000	65,000	.40	.....	
13,200	66,000	.52	.....	
13,250	66,250	.63	.....	Tensile strength.
11,000	.....	.....	.....	Load at time of rupture.
0	0	.83	.....	= 27.7 per cent.

Elongation of inch sections, ″.19, *″.38, ″.26.
Diameter at fracture, ″.33.
Area, .0855 square inch.
Contraction, 57.2 per cent.
Fractured 1.28 from neck. Appearance, fine, silky.

No. 730.

No. 3.—*O. H. steel, compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0003	0.	
2,000	10,000	.0007	0.	
3,000	15,000	.0011	0.	
4,000	20,000	.0016	0.	
5,000	25,000	.0021	0.	
6,000	30,000	.0027	0.	
7,000	35,000	.0031	.....	
8,000	40,000	.0037	.....	
8,200	41,000	.0038	.....	
8,400	42,000	.0039	.....	
8,600	43,000	.0040	.....	Elastic limit.
8,800	44,000	.0805	.....	
9,000	45,000	.0870	.....	
9,200	46,000	.0915	.....	
9,400	47,000	.1030	.....	
9,600	48,000	.1060	.....	
9,800	49,000	.1130	.....	
10,000	50,000	.1220	.....	
10,200	51,000	.1300	.....	
10,400	52,000	.1390	.....	
10,600	53,000	.1490	.....	
10,800	54,000	.1603	.....	
11,000	55,000	.18	.....	
11,200	56,000	.20	.....	
11,400	57,000	.21	.....	
11,600	58,000	.23	.....	
11,800	59,000	.24	.....	
12,000	60,000	.27	.....	
12,200	61,000	.30	.....	
12,400	62,000	.34	.....	
12,600	63,000	.40	.....	
12,800	64,000	.50	.....	
12,860	64,300	.62	.....	Tensile strength.
10,050	.....	.....	.....	Load at time of rupture.
0	0	.83	.....	=27.7 per cent.

Elongation of inch sections, ″.47, ″.20, ″.16.
Diameter at fracture, ″.31.
Area, .0755 square inch.
Contraction, 62.2 per cent.
Fractured, ″.70 from neck. Appearance, fine, silky.

No. 702.

No. 3.—*Wrought-iron, uncompressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0004	0.	
2,000	10,000	.0009	0.	
3,000	15,000	.0015	0.	
4,000	20,000	.0020	0.	
5,000	25,000	.0025	0.	
5,400	27,000	.0029	.....	
5,600	28,000	.0030	.....	
5,800	29,000	.0031	.....	
6,000	30,000	.0033	.0001	
6,200	31,000	.0034	.....	Elastic limit.
6,400	32,000	.0040	.....	
6,600	33,000	.0061	.....	
6,800	34,000	.0115	.....	
7,000	35,000	.0170	.....	
7,200	36,000	.0272	.....	
7,400	37,000	.0400	.....	
7,600	38,000	.0480	.....	
7,800	39,000	.0568	.....	
8,000	40,000	.0670	.....	
8,200	41,000	.0768	.....	
8,400	42,000	.0890	.....	
8,600	43,000	.1005	.....	
8,800	44,000	.1150	.....	
9,000	45,000	.1305	.....	
9,200	46,000	.1475	.....	
9,400	47,000	.1713	.....	
9,600	48,000	.19	.....	
9,800	49,000	.21	.....	
10,000	50,000	.24	.....	
10,200	51,000	.28	.....	
10,400	52,000	.32	.....	
10,600	53,000	.40	.....	
10,800	54,000	.52	.....	
10,840	54,200	.63	.....	Tensile strength.
9,300	.....	.....	.....	Load at time of fracture.
0	0	.83	.....	= 27.7 per cent.

Elongation of inch sections, *″.39, ″.25, ″.19.
Diameter at fracture, ″.37.
Area, .108 square inch.
Contraction, 46.2 per cent.
Fractured ″.95 from neck. Appearance, fine, fibrous.

No. 728.

No. 1.— *Wrought-iron, compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0003	0.	
2,000	10,000	.0007	0.	
3,000	15,000	.0012	0.	
4,000	20,000	.0018	0.	
4,200	21,000	.0020	.....	
4,400	22,000	.0022	.....	
4,600	23,000	.0024	.....	
4,800	24,000	.0025	.....	
5,000	25,000	.0026	0.	
5,200	26,000	.0026	.....	
5,400	27,000	.0028	.....	Elastic limit.
5,600	28,000	.0032	.....	
5,800	29,000	.0037	.....	
6,000	30,000	.0049	.0017	
6,200	31,000	.0063	.....	
6,400	32,000	.0093	.....	
6,600	33,000	.0132	.....	
6,800	34,000	.0180	.....	
7,000	35,000	.0230	.....	
7,200	36,000	.0285	.....	
7,400	37,000	.0350	.....	
7,600	38,000	.0430	.....	
7,800	39,000	.0505	.....	
8,000	40,000	.0590	.....	
8,200	41,000	.0675	.....	
8,400	42,000	.0761	.....	
8,600	43,000	.0865	.....	
8,800	44,000	.0990	.....	
9,000	45,000	.1015	.....	
9,200	46,000	.1230	.....	
9,400	47,000	.1380	.....	
9,600	48,000	.1570	.....	
9,800	49,000	.18	.....	
10,000	50,000	.21	.....	
10,200	51,000	.23	.....	
10,400	52,000	.27	.....	
10,600	53,000	.30	.....	
10,800	54,000	.37	.....	
11,000	55,000	.44	.....	
11,090	55,450	.60	.....	Tensile strength.
10,300	.....	.....	.....	Load at time of rupture.
0	0	.75	.....	=25.0 per cent.

Elongation of inch sections, ″.21, *″.35, ″.19.
Diameter at fracture, ″.39.
Area, .1194 square inches.
Contraction, 40.3 per cent.
Fractured 1″.60 from neck. Appearance, fine, fibrous.

No. 704.

Cast-iron, uncompressed.

Marks, $^{12T}_{C_5}$
Diameter, ″.500.
Sectional area, .196 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
196	1,000	0.	0.	Initial load.
392	2,000	.0001	.....	
588	3,000	.0003	.....	
784	4,000	.0005	.....	
980	5,000	.0006	0.	
1,176	6,000	.0001	.....	
1,372	7,000	.0008	.....	
1,568	8,000	.0010	.....	
1,764	9,000	.0011	.....	
1,960	10,000	.0013	0.	
2,156	11,000	.0014	.....	
2,352	12,000	.0016	.....	
2,548	13,000	.0019	.....	
2,744	14,000	.0021	.....	
2,940	15,000	.0023	.0001	
3,136	16,000	.0025	.....	
3,332	17,000	.0027	.....	
3,528	18,000	.0031	.....	
3,724	19,000	.0034	.....	
3,920	20,000	.0037	.0007	
4,116	21,000	.0040	.....	
4,312	22,000	.0044	.....	
4,508	23,000	.0048	.....	
4,704	24,000	.0054	.....	
49,000	25,000	.....	.....	Tensile strength.

Fractured ″.45 from neck. Appearance, granular, mottled.

No. 738.

Cast-iron, compressed.

Marks, $\frac{12T}{C_6}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
400	2,000	.0003	.....	
600	3,000	.0006	.....	
800	4,000	.0008	.....	
1,000	5,000	.0010	0.	
1,200	6,000	.0012	.....	
1,400	7,000	.0013	.....	
1,600	8,000	.0013	.....	
1,800	9,000	.0014	.....	
2,000	10,000	.0017	.0003	
2,200	11,000	.0020	.....	
2,400	12,000	.0022	.....	
2,600	13,000	.0024	.....	
2,800	14,000	.0026	.....	
3,000	15,000	.....	.....	
3,200	16,000	.....	.....	
3,400	17,000	.....	.....	
3,600	18,000	.....	.....	
3,800	19,000	.....	.....	
4,000	20,000	.....	.....	
4,200	21,000	.....	.....	
4,400	22,000	.....	.....	
4,600	23,000	.....	.....	
4,680	23,400	.....	.....	Tensile strength.

Fractured ″.25 from middle of stem. Appearance, granular, mottle

No. 688.

Drawn brass, uncompressed.

Marked No. 2.
Total length, 4″.5.
Diameter, ″.55.
Sectional area, .228 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
228	1,000	0.	0.	Initial load.
1,140	5,000	.0007	0.	
2,280	10,000	.0017	0.	
3,420	15,000	.0027	0.	
4,560	20,000	.0037	0.	
5,700	25,000	.0050	.0003	
6,840	30,000	.0071	.0008	
7,068	31,000	.0074	.....	
7,296	32,000	.0078	.....	
7,524	33,000	.0082	.....	E'astic limit.
7,752	34,000	.0091	.....	
7,980	35,000	.0102	.0026	
8,208	36,000	.0110	.....	
8,436	37,000	.0125	.....	
8,664	38,000	.0150	.....	
8,892	39,000	.0189	.....	
9,120	40,000	.0223	.0118	
9,348	41,000	.0299	.....	
9,576	42,000	.0502	.....	
9,804	43,000	.0940	.....	
10,032	44,000	.1110	.....	
10,260	45,000	.1434	.....	
10,488	46,000	.185	.....	
10,716	47,000	.22	.....	
10,944	48,000	.26	.....	
11,172	49,000	.32	.....	
11,400	50,000	.34	.....	
11,628	51,000	.48	.....	
11,856	52,000	.55	.....	
12,084	53,000	.65	.....	
12,400	54,385	1.00	.....	Tensile strength.

No. 689.

Drawn brass rod, compressed.

Marked No. 1.
Diameter, ″.55.
Sectional area, .228 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
228	1,000	0.	0.	Initial load.
1,140	5,000	.0005	0.	
2,280	10,000	.0014	0.	
3,420	15,000	.0026	0.	
4,560	20,000	.0036	.0001	
5,700	25,000	.0053	.0006	
6,840	30,000	.0070	.0011	
7,068	31,000	.0077	.....	
7,296	32,000	.0081	.....	
7,524	33,000	.0087	.....	Elastic limit.
7,752	34,000	.0095	.....	
7,980	35,000	.0107	.0031	
8,208	36,000	.0117	.....	
8,436	37,000	.0127	.....	
8,664	38,000	.0149	.....	
8,892	39,000	.0189	.....	
9,120	40,000	.0238	.0140	
9,348	41,000	.0321	.....	
9,576	42,000	.0546	.....	
9,804	43,000	.0785	.....	
10,032	44,000	.1038	.....	
10,260	45,000	.14	.....	
10,488	46,000	.18	.....	
10,716	47,000	.22	.....	
10,944	48,000	.23	.....	
11,172	49,000	.31	.....	
11,400	50,000	.38	.....	
11,628	51,000	.44	.....	
11,856	52,000	.52	.....	
12,084	53,000	.68	.....	
12,312	54,000	.83	.....	
12,380	54,298	.....	.....	Tensile strength.

No. 700.

No. 1.—*Drawn copper, uncompressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0006	0.	
2,000	10,000	.0016	0.	
2,400	12,000	.0022	.....	
2,800	14,000	.0026	.....	
3,000	15,000	.0027	.0002	
3,200	16,000	.0029	.....	
3,400	17,000	.0031	.....	
3,600	18,000	.0033	.....	
3,800	19,000	.0035	.....	
4,000	20,000	.0037	.0002	
4,200	21,000	.0037	.....	
4,400	22,000	.0041	.....	
4,600	23,000	.0044	.....	
4,800	24,000	.0046	.....	
5,000	25,000	.0047	.0004	
5,200	26,000	.0052	.....	
5,400	27,000	.0055	.....	
5,600	28,000	.0061	.....	
5,800	29,000	.0067	.....	
6,000	30,000	.0083	.0027	
6,200	31,000	.0250	.....	
6,400	32,000	.1185	.....	
6,600	33,000	.25	.....	
6,800	34,000	.47	.....	
6,880	34,400	.90	.....	Tensile strength.
0	0	1.05	.....	=35.0 per cent.

Elongation of inch sections, * ″.49, ″.36, ″.21.
Diameter at fracture, ″.32.
Area, .080 square inch.
Contraction, 60.0 per cent.
Fractured 1″.2 from neck. Appearance, fine, silky.

No. 732.

No. 1 C.—*Copper, compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0006	0.	
2,000	10,000	.0014	0.	
3,000	15,000	.0021	.0001	
3,200	16,000	.0025	.....	
3,400	17,000	.0027	.....	
3,600	18,000	.0029	.....	
3,800	19,000	.0031	.....	
4,000	20,000	.0034	.0002	
4,200	21,000	.0036	.....	
4,400	22,000	.0038	.....	
4,600	23,000	.0042	.....	
4,800	24,000	.0045	.....	
5,000	25,000	.0047	.0005	
5,200	26,000	.0052	.....	
5,400	27,000	.0056	.....	
5,600	28,000	.0061	.....	
5,800	29,000	.0071	.....	
6,000	30,000	.0101	.0046	
6,200	31,000	.0594	.....	
6,400	32,000	.1650	.....	
6,600	33,000	.31	.....	
6,800	34,000	.53	.....	
6,830	34,150	.79	.....	Tensile strength.
5,300	.....	.....	.....	Load at time of rupture.
0	0	1.19	.....	=39.7 per cent.

Elongation of inch sections, ″.39, *″.53, ″.27.
Diameter at fracture, ″.30.
Area, .0707 square inch.
Contraction, 64.7 per cent.
Fractured 1″.50 from neck. Appearance, fine, silky.

No. 699.

No. 1.—*Banca tin, uncompressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
200	1,000	0.	0.	Initial load.
		.0011	.....	After 5 minutes' rest.
300	1,500	.0075	.....	Immediate elongation.
		.0188	.....	After 5 minutes' rest.
400	2,000	.0290	.....	
		.0861	.....	
500	2,500	.1175	.....	
		.2825	.....	
600	3,000	.40	.....	Tensile strength.
		1.92	.....	After 4½ minutes' rest.
0	0	2.03	.....	=67.7 per cent.

Elongation of inch sections, ″.51, ″.53, *″.99.
Diameter at fracture, about ″.15.
Area, .018 square inch.
Contraction, 91.0 per cent.
Fractured 1″.10 from neck.

No. 734.

No. 1 C.—*Banca tin, compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
200	1,000	0.	0.	Initial load.
		.0007	.....	After 5 minutes' rest.
300	1,500	.0050	.....	
		.0199	.....	Do.
400	2,000	.0321	.....	
		.1000	.....	Do.
500	2,500	.13	.....	
		.385	.....	Do.
600	3,000	.49	.....	Tensile strength.
		1.21	.....	After 2½ minutes' rest.
0	0	2.12	.....	=70.7 per cent.

Elongation of inch sections, *″.77, ″.80, ″.55.
Diameter at fracture, about ″.09.
Area, .0063 square inch.
Contraction, 96.8 per cent.
Fractured 1½″ from neck.

No. 701.

No. 1.—*Lead, uncompressed.*

Diameter, ″.500.
Sectional area, .196 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
98	500	0.	0.	Initial load.
196	1,000	.0182	.....	Immediate elongation.
		.0238	.....	After 5 minutes' rest.
294	1,500	.1340	.....	
		.1371	.....	
392	2,000	.32	.....	
		.49	.....	
464	2,367	1.10	.....	Tensile strength,
0	0	1.34	.....	=44.7 per cent.

Elongation of inch sections, *″.75, ″.29, ″.30.
Diameter at fracture, ″.13.
Area, .013 square inch.
Contraction, 93.4 per cent.
Fractured 1″.30 from neck.

No. 736.

No. 1 C.—*Lead, compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
100	500	0.	0.	Initial load.
200	1,000	.0006	.....	
		.0007	.....	After 5 minutes' rest.
300	1,500	.0061	.....	
		.0073	.....	
400	2,000	.0448	.....	
		.0468	.....	
500	2,500	.1231	.....	
		.1364	.....	
600	3,000	.240	.....	
		.346	.....	
700	3,500	.80	.....	Tensile strength.
		1.20	.....	After 2 minutes' rest.
0	0	1.40	.....	=46.7 per cent.

Elongation of inch sections, ″.33, ″.37, *″.70.
Diameter at fracture, about ″.16.
Area, .0201 square inch.
Contraction, 89.9 per cent.
Fracture, ″.90 from neck.
Cylindrical surface of stem fine mottled.

No. 744.

Silecian zinc, 1C, compressed.

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
400	2,000	.0004	.....	
600	3,000	.0031	.....	
660	3,300	.....	.....	Tensile strength.

Fractured ″.3 from neck. Appearance, granular.

DETAILS OF COMPRESSION TESTS.

No. 773.

Mild steel, uncompressed.

Mark, No. 2.
Total length, 5″.52.
Diameter, ″.800.
Sectional area, .503 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
503	1,000	0.	0.	Initial load.
2,515	5,000	.0003	0.	
5,030	10,000	.0009	0.	
7,545	15,000	.0012	0.	
10,060	20,000	.0017	0.	
12,575	25,000	.0022	0.	
15,090	30,000	.0027	0.	
17,605	35,000	.0034	0.	
18,108	36,000	.0035	.....	
18,611	37,000	.0036	.....	Elastic limit.
19,114	38,000	.0038	.....	
19,617	39,000	.0050	.....	
20,120	40,000	.0175	.....	
20,623	41,000	.0493	.....	
26,240	52,167	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 731.

Mild steel, compressed.

Mark, 4.
Total length, 5″.510.
Diameter, ″.7998.
Sectional area, .503 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
503	1,000	0.	0.	Initial load.
2,515	5,000	.0001	—.0001	
5,030	10,000	.0005	—.0001	
7,545	15,000	.0010	—.0001	
10,060	20,000	.0015	—.0001	
12,575	25,000	.0020	—.0001	
15,090	30,000	.0025	—.0001	
17,605	35,000	.0029	—.0001	
18,108	36,000	.0039	.....	
18,611	37,000	.0033	.....	
19,114	38,000	.0035	.....	Elastic limit.
19,617	39,000	.0043	.....	
20,120	40,000	.0110	.....	
20,623	41,000	.0220	.....	
27,280	54,234	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 772.

No. 4.—*Wrought-iron, uncompressed.*

Total length, 5″.515.
Diameter, ″.819.
Sectional area, .527 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
527	1,000	0.	0.	Initial load.
2,635	5,000	.0005	0.	
5,270	10,000	.0010	0.	
7,905	15,000	.0015	0.	
10,540	20,000	.0020	0.	
13,175	25,000	.0026	.0001	
13,702	26,000	.0028	.....	
14,229	27,000	.0030	.....	
14,756	28,000	.0031	.....	Elastic limit.
15,283	29,000	.0037	.....	
15,810	30,000	.0110	.0081	
16,337	31,000	.0200	.....	
16,864	32,000	.0216	.....	
22,900	43,454	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 729.

No. 2.—*Wrought-iron, compressed.*

Original dimensions:
Length, 5″.510.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
2,210	5,000	.0005	0.	
4,420	10,000	.0009	0.	
6,630	15,000	.0014	0.	
8,840	20,000	.0019	0.	
11,050	25,000	.0024	0.	
11,492	26,000	.0025	.....	
11,934	27,000	.0026	.....	
12,376	28,000	.0028	.....	
12,818	29,000	.0029	.....	
13,260	30,000	.0030	.0001	
13,702	31,000	.0032	.....	
14,144	32,000	.0033	.....	
14,586	33,000	.0036	.....	
15,028	34,000	.0040	.....	Elastic limit.
15,470	35,000	.0092	.0063	
15,912	36,000	.1376	.....	
21,100	47,737	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 777.

Cast-iron, uncompressed.

Marks, $\frac{12T}{C_4}$
Total length, 5″.46.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
884	2,000	0.	.....	
1,326	3,000	.0002	.....	
1,768	4,000	.0004	.....	
2,210	5,000	.0006	0.	
2,652	6,000	.0007	.....	
3,094	7,000	.0008	.....	
3,536	8,000	.0010	.....	
3,978	9,000	.0012	.....	
4,420	10,000	.0013	0.	
4,862	11,000	.0015	.....	
5,304	12,000	.0016	.....	
5,746	13,000	.0017	.....	
6,188	14,000	.0019	.....	
6,630	15,000	.0021	.0001	
7,072	16,000	.0022	.....	
7,514	17,000	.0023	.....	
7,956	18,000	.0025	.....	
8,398	19,000	.0027	.....	
8,840	20,000	.0029	.0002	
9,282	21,000	.0030	.....	
9,724	22,000	.0032	.....	
10,166	23,000	.0034	.....	
10,608	24,000	.0036	.....	
11,050	25,000	.0038	.0003	
11,492	26,000	.0041	.....	
11,934	27,000	.0043	.....	
12,376	28,000	.0046	.....	
12,818	29,000	.0050	.....	
13,260	30,000	.0054	.0011	
13,702	31,000	.0057	.....	
14,144	32,000	.0061	.....	
14,586	33,000	.0069	.....	
15,028	34,000	.0075	.....	
15,470	35,000	.0085	.0033	
15,912	36,000	.0091	.....	
16,354	37,000	.0100	.....	
16,796	38,000	.0111	.....	
17,238	39,000	.0125	.....	
17,680	40,000	.0140	.0079	
18,122	41,000	.0153	.....	
18,564	42,000	.0161	.....	
19,006	43,000	.0175	.....	
19,448	44,000	.0194	.....	
19,890	45,000	.0207	.0137	
20,332	46,000	.0222	.....	
20,774	47,000	.0235	.....	
21,216	48,000	.0248	.....	
21,658	49,000	.0262	.....	
22,100	50,000	.0280	.0201	
22,542	51,000	.0293	.....	
22,984	52,000	.0311	.....	
23,426	53,000	.0321	.....	
23,868	54,000	.0335	.....	
24,310	55,000	.0355	.0265	
24,752	56,000	.0365	.....	
25,194	57,000	.0375	.....	
25,636	58,000	.0386	.....	
26,078	59,000	.0400	.....	
26,520	60,000	.0410	.0316	
26,962	61,000	.0418	.....	
27,404	62,000	.0425	.....	Rapid deflection, convex on micrometer side of specimen.
27,846	63,000	.0425	.....	
28,288	64,000	.0419	.....	
28,730	65,000	.0407	.0312	
33,700	76,244	.....	.....	Ultimate strength.

Triple flexure.

No. 739.

Cast-iron, compressed.

Marks, $^{12T}_{c_4}$
Total length, 5″.482.
Diameter, ″.7494.
Sectional area, .441 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
441	1,000	0.	0.	Initial load.
882	2,000	.0002	.....	
1,323	3,000	.0002	.....	
1,764	4,000	.0004	.....	
2,205	5,000	.0005	0.	
2,646	6,000	.0007	.....	
3,087	7,000	.0009	.....	
3,528	8,000	.0011	.....	
3,969	9,000	.0012	.....	
4,410	10,000	.0014	0.	
4,851	11,000	.0015	.....	
5,292	12,000	.0017	.....	
5,733	13,000	.0019	.....	
6,174	14,000	.0020	.....	
6,615	15,000	.0021	0.	
7,056	16,000	.0022	.....	
7,497	17,000	.0024	.....	
7,938	18,000	.0025	.....	
8,379	19,000	.0026	.....	
8,820	20,000	.0028	.0001	
9,261	21,000	.0030	.....	
9,702	22,000	.0033	.....	
10,143	23,000	.0035	.....	
10,584	24,000	.0036	.....	
11,025	25,000	.0039	.0003	
11,466	26,000	.0040	.....	
11,907	27,000	.0043	.....	
12,348	28,000	.0046	.....	
12,789	29,000	.0048	.....	
13,230	30,000	.0052	.0009	
13,671	31,000	.0055	.....	
14,112	32,000	.0059	.....	
14,553	33,000	.0065	.....	
14,994	34,000	.0070	.....	
15,435	35,000	.0075	.0024	
15,876	36,000	.0084	.....	
16,317	37,000	.0094	.....	
16,758	38,000	.0103	.....	
17,199	39,000	.0116	.....	
17,640	40,000	.0127	.0066	
18,081	41,000	.0136	.....	
18,522	42,000	.0152	.....	
18,963	43,000	.0166	.....	
19,404	44,000	.0183	.....	
19,845	45,000	.0200	.0130	
20,286	46,000	.0216	.....	
20,727	47,000	.0231	.....	
21,168	48,000	.0246	.....	
21,609	49,000	.0270	.....	
22,050	50,000	.0288	.0207	
22,491	51,000	.0306	.....	
22,932	52,000	.0319	.....	
23,373	53,000	.0349	.....	
23,814	54,000	.0364	.....	
24,255	55,000	.0390	.0295	
24,696	56,000	.0410	.....	
25,137	57,000	.0431	.....	
25,578	58,000	.0458	.....	
26,019	59,000	.0488	.....	
26,460	60,000	.0521	.0406	
26,901	61,000	.0538	.....	
27,342	62,000	.0569	.....	

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
27,783	63,000	.0607	.....	
28,224	64,000	.0671	.....	
28,665	65,000	.0700	.....	
29,106	66,000	.0775	.....	
29,547	67,000	.0863	.....	
29,988	68,000	.0917	.....	
33,800	76,643	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 771.

Drawn brass, uncompressed.

Total length, 5″.495.
Diameter, ″.740.
Sectional area, .44 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
430	1,000	0.	0.	Initial load.
2,150	5,000	.0008	0.	
4,300	10,000	.0017	0.	
6,450	15,000	.0026	0.	
8,600	20,000	.0036	0.	
10,750	25,000	.0046	0.	
12,900	30,000	.0062	.0007	
13,330	31,000	.0065	.....	
13,760	32,000	.0071	.....	
14,190	33,000	.0078	.....	
14,620	34,000	.0085	.....	
15,050	35,000	.0096	.0030	
15,480	36,000	.0104	.....	
15,910	37,000	.0121	.....	
16,340	38,000	.0137	.....	
16,770	39,000	.0164	.....	
17,200	40,000	.0195	.0110	
18,060	42,000	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 727.

Drawn brass, compressed.

Total length, 5″.507.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
2,210	5,000	.0010	.0001	
4,420	10,000	.0020	.0001	
6,630	15,000	.0031	.0003	
8,840	20,000	.0041	.0003	
11,050	25,000	.0052	.0005	
13,260	30,000	.0066	.0008	
13,702	31,000	.0068	.....	
14,144	32,000	.0071	.....	
14,586	33,000	.0075	.....	
15,028	34,000	.0080	.....	
15,470	35,000	.0086	.0015	
15,912	36,000	.0090	.....	
16,354	37,000	.0102	.....	
16,796	38,000	.0118	.....	
17,238	39,000	.0128	.....	
17,680	40,000	.0143	.0057	
18,122	41,000	.0158	.....	
18,564	42,000	.0178	.....	
19,006	43,000	.0201	.....	
19,448	44,000	.0220	.....	
19,890	45,000	.0250	.....	
23,580	53,348	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 774.

Drawn copper, uncompressed.

Total length, 5″.50.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
2,210	5,000	.0005	0.	
4,520	10,000	.0015	0.	
6,630	15,000	.0026	0.	
8,840	20,000	.0040	.0004	
9,282	21,000	.0044	.....	
9,724	22,000	.0048	.....	
10,166	23,000	.0051	.....	
10,608	24,000	.0056	.....	
11,050	25,000	.0061	.0015	
11,492	26,000	.0067	.....	
11,934	27,000	.0076	.....	
12,376	28,000	.0085	.....	
12,818	29,000	.0095	.....	
13,260	30,000	.0111	.0056	
13,702	31,000	.0183	.....	
13,880	31,402	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 733.

Drawn copper, compressed.

Total length, 5″.510.
Diameter, ″.7501.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
2,210	5,000	.0007	0.	
4,420	10,000	.0016	0.	
6,630	15,000	.0027	.0001	
8,840	20,000	.0040	.0006	
9,282	21,000	.0045	.....	
9,724	22,000	.0049	.....	
10,166	23,000	.0053	.....	
10,608	24,000	.0058	.....	
11,050	25,000	.0063	.0019	
11,492	26,000	.0071	.....	
11,934	27,000	.0080	.....	
12,376	28,000	.0090	.....	
12,818	29,000	.0105	.....	
13,260	30,000	.0133	.0071	
13,860	31,359	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 775.

Banca tin, uncompressed.

Total length, 5″.5.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
		.0140	.....	
884	2,000	.0260	.....	After 1 minute.
		.0332	.....	After 2 minutes.
1,220	2,760	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 735.

Banca tin, compressed.

Total length, 5″.497.
Diameter, ″.7502.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
884	2,000	.0400 .9965	.....	After 1 minute.
1,120	2,533	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks. Mottled surface finer than the uncompressed specimen.

No. 776.

Lead, uncompressed.

Total length, 5″.50.
Diameter, ″.750.
Sectional area, .442 square inch.
Ultimate strength, 1,010 pounds=2,285 pounds per square inch.
Failed by triple flexure. Coarse mottled surface. Bent 180° without fracture.

No. 737.

Lead, compressed.

Total length, 5″.502.
Diameter, ″.7491.
Sectional area, .441 square inch.
Ultimate strength, 1,170 pounds=2,653 pounds per square inch.
Failed by triple flexure. Fine mottled surface. Bent 180° without fracture.

No. 740.

White pine, compressed.

Original dimensions:
Length, 5″.506.
Diameter, ″.743.
Sectional area, .434 square inch.
Crushing strength, 2,390 pounds=5,507 pounds per square inch.
Fibers crushed at end of stick.

No. 742.

White oak, compressed

Original dimensions:
Length, 5″.522.
Diameter, ″.740.
Sectional area, .43 square inch.
Crushing strength, 3,460 pounds=8,046 pounds per square inch.
Failed by deflection at middle of length.

Tabulation of results with cubic compression specimens.

Material.	Tension tests.					
	Elastic limit.		Tensile strength.		Elongation.	
	Not compressed.	Compressed.	Not compressed.	Compressed.	Not compressed.	Compressed.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*
Mild steel	44,000	43,000	66,250	64,300	27.7	27.7
Wrought-iron	31,000	27,000	54,200	55,450	27.7	25.0
Cast-iron	.....	.....	25,000	23,400	.....	.....
Drawn brass	33,000	33,000	54,385	54,298	.....	.....
Drawn copper	.....	.....	34,400	34,150	35.0	39.7
Banca tin	.....	.....	3,000	3,000	67.7	70.7
Lead	.....	.....	2,367	3,500	44.7	46.7
Silesian zinc	.....	.....	3,300	.....	.....	.....
White pine	.....	.....	.....	.....	.....	.....
White oak	.....	.....	.....	.....	.....	.....

Material.	Tension tests.				Compression tests (ultimate strength).	
	Contraction of area.		Appearance of fracture.			
	Not compressed.	Compressed.	Not compressed.	Compressed.	Not compressed.	Compressed.
	Per cent.	*Per cent.*			*Pounds.*	*Pounds.*
Mild steel	57.2	62.2	Fine, silky	Fine, silky	52,167	54,234
Wrought-iron	46.2	40.3	Fine, fibrous	Fine, fibrous	43,454	47,737
Cast-iron	.....	.....	Granular, mottled.	Granular, mottled.	76,244	76,643
Drawn brass	.....	.....	.....	.....	42,060	53,348
Drawn copper	60.0	64.7	Fine, silky	Fine, silky	31,402	31,359
Banca tin	91.0	96.8	.....	.....	2,760	2,533
Lead	93.4	80.9	.....	.....	2,285	2,653
Silesian zinc	.....	.....	Granular	.....	.....	.....
White pine	.....	.....	.....	.....	.....	5,507
White oak	.....	.....	.....	.....	.....	8,046

COMPRESSION OF BRICK PIERS.

1689

COMPRESSION OF BRICK PIERS

This series comprises the tests of fifty-three piers, the cross-section dimensions of which range from 8″×8″ to 16″×16″, and the heights from 2 feet to 12½ feet.

Two kinds of bricks were used in their construction—common, hard burnt and face bricks, laid on bed with joints broken every course.

The mortar was composed of one part Rosendale cement and two parts sand.

The piers were built in September, 1884, and were twenty-one months old when tested; in the mean time they had seasoned in a dry, cool building.

Tests of the individual bricks are found in the Report of Tests, 1885.

An earlier series of tests (see Report, 1884) showed the strength of piers as modified by mortars of different composition. In the present series it was intended that the mortar should be the same throughout, and the variations in strength developed depend upon the dimensions of the piers. The mortar, however, was found to vary in quality, and much stronger in some places than others.

The piers were transported from the building in which they were built and seasoned to the testing machine in a fixture consisting of two flat plates placed over the ends of the piers and connected by side rods which were provided with turn-buckles. Tightening the buckles, the piers were put in a state of compression sufficient to enable them to be handled without injury. After adjustment in the testing machine the tension of the side rods was released; but the tension of these rods being greater than the initial load at the commencement of the test, the early compression measurements were doubtless affected thereby.

Piers 4 feet and less in height were handled without plates and rods, hence the recorded compression of these piers is the normal amount from the initial load upward.

Loads were gradually applied and compression measurements taken after equal increments, thus proceeding till the maximum load was reached which the pier was capable of sustaining. Tests were discontinued after the maximum load had been passed, the resistance of the pier falling off as cracks in the brick-work became general.

The failure of a pier takes place in detail, cracks occurring under loads much below the maximum, and which continue to increase in size and number as the loads advance.

There was tendency in many of the piers to crack first in the upper courses; the irregularity of strength thus indicated was attributed to the consolidation which the mortar in the lower courses receives when first laid, from the weight of the brick-work above.

As described in a previous report, cracks are opened in a longitudinal direction, that is, parallel to the axis of the pier, and appear first through the middle of the length of the solid brick opposite the end joints of the adjacent courses.

The efficiency of each pier is given in the tabulation in per centum of the strength of single bricks—the average crushing strength of three face bricks was 13,353 pounds per square inch, and of five common bricks, 15,818 pounds per square inch.

A diagram follows, showing the relative strength of the piers tested, in which the abscissas represent the total height in feet, and the ordinates the crushing strength in pounds per square inch.

An inspection of the diagram shows the strength of piers to depend upon their total heights, also upon their sectional areas, from which it follows that volume is a function of the ultimate resistance.

Increasing the height or enlarging the cross-section dimensions effects a reduction in resistance.

Piers with bond-stones have a strength intermediate between the strength of a pier of their total height and those of the height between bond-stones.

The quality of the grout in the grouted piers was not satisfactory, being soft and easily crumbled; these piers showed inferior resistance doubtless from this cause.

Very low strength is displayed in the 12-inch face-brick pier with hollow core, which was laid without mortar. A weak mortar assists materially in distributing the stress over the bed surface of the brick, which is concentrated at few points when the pier is laid dry.

Crushing strength of cubes and prisms representing the mortar used in the construction of the brick piers. Age when tested, 17 *months.*

CUBES.

No. of test.	Composition.	Dimensions.			Sectional area.	Ultimate strength.		Weight per cubic foot.	Remarks.
		Height.	Compressed surface.			Total.	Per sq. inch.		
		Inches.	*Ins.*	*Ins.*	*Sq.inch.*	*Pounds*	*Pounds*	*Pounds.*	
721	1 part cement, 2 parts sand.	6.11	5.95	5.90	35.105	5,520	157	108.7	Pyramidal fracture.
722	....do.....	6.17	5.98	5.91	35.340	5,600	158	107.0	Do.
723	....do.....	6.22	5.90	5.93	34.987	5,810	166	107.6	Do.

PRISMS.

724	1 part cement, 2 parts sand.	17.97	5.95	5.96	35.46	5,200	147	104.3	Pyramidal fracture.
725	....do.....	17.98	5.95	5.96	35.46	5,420	153	105.7	Do.
726	....do.....	18.03	5.97	5.96	35.58	5,300	149	106.4	Do.

DETAILS OF TESTS OF MORTAR AND BRICK PIERS.

No. 724.

Height, 17″.97.
Compressed surface, 5″.95×5″.96=35.46 square inches.
Gauged length, 15″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0015	.....	
1,500	.....	.0031	.....	
2,000	.....	.0047	.0014	
2,500	.....	.0064	.....	
3,000	.....	.0080	.0025	
3,500	.....	.0096	.....	
4,000	.....	.0116	.0047	
4,500	.....	.0145	.....	
5,000	.....	.0200	.0099	
5,200	147	.....	.....	Crushing strength.
.....	.....	.....	.....	Pyramidal fracture.

No. 725.

Height, 17″.98.
Compressed surface, 5″.95×5″.96=35.46 square inches.
Gauged length, 15″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0005	.....	
1,500	.....	.0017	.....	
2,000	.....	.0027	.0001	
2,500	.....	.0040	.....	
3,000	.....	.0053	.0006	
3,500	.....	.0072	.....	
4,000	.....	.0090	.0019	
4,500	.....	.0115	.....	
5,000	.....	.0157	.0055	
5,000	.....	.0170	.....	Reading after taking set.
5,420	153	.....	.....	Crushing strength.

No. 726.

Height, 18″.03.
Compressed surface, 5″.97×5″.96=35.58 square inches.
Gauged length, 15″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0007	.....	
1,500	.....	.0018	.....	
2,000	.....	.0028	.0004	
2,500	.....	.0038	.....	
3,000	.....	.0052	.0015	
3,500	.....	.0071	.....	
4,000	.....	.0095	.0035	
4,500	.....	.0128	.....	
5,000	.....	.0176	.0061	
5,300	149	.....	.....	Crushing strength.

No. 851.

8-inch brick pier.

Built of ten courses of face brick.
Total weight, 107 pounds.
Weight per cubic foot, 132.7 pounds.
Total height, 24″.
Sectional area, 7″.61×7″.63=58.06 square inches.
Average thickness of joints, ″.22.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
138,000	.....	.....	.....	Cracks.
141,000	2,428	.....	.....	Ultimate strength.

Opened longitudinal seams and crushed the bricks.

No. 852.

8-inch brick pier.

Built of ten courses of face brick.
Total weight, 110 pounds.
Weight per cubic foot, 134.4 pounds.
Total height, 24″.27.
Sectional area, 7″.64×7″.63=58.29 square inches.
Average thickness of joints, ″.23.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
116,000	.....	.....	.....	Cracks.
123,400	2,117	.....	.....	Ultimate strength.

Opened longitudinal seams and crushed bricks in end course.

No. 853.

8-inch brick pier.

Built of twenty courses of face brick.
Total weight, 215 pounds.
Weight per cubic foot, 130.2 pounds.
Total height, 47″.95.
Sectional area, 7″.68×7″.75=59.52 square inches.
Average thickness of joints, ″.21.
Gauged length, ″.40.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,952	100	0.	0.	Initial load.
8,928	150	.0017	.....	
11,904	200	.0034	.....	
14,880	250	.0051	.....	
17,856	300	.0069	.....	
20,832	350	.0089	.....	
23,808	400	.0111	.....	
26,784	450	.0133	.....	
29,760	500	.0159	.0041	
32,736	550	.0180	.....	
35,712	600	.0210	.....	
38,688	650	.0238	.....	
41,664	700	.0269	.....	
44,664	750	.0300	.....	
47,616	800	.0345	.....	
50,592	850	.0383	.....	
53,568	900	.0422	.....	
56,544	950	.0469	.....	
59,520	1,000	.0517	.0219	
62,496	1,050	.0583	.....	
65,472	1,100	.0619	.....	
68,448	1,150	.0660	.....	
71,424	1,200	.0719	.....	
74,400	1,250	.0770	.....	
77,376	1,300	.0809	.....	
80,352	1,350	.0880	.....	
83,328	1,400	.0949	.....	
86,304	1,450	.1006	.....	
89,280	1,500	.1059	.....	
92,256	1,550	.1134	.....	
95,232	1,600	.1168	.....	Piece flaked off brick near middle of height.
98,208	1,650	.1220	.....	Sustained this load 3 minutes.
101,184	1,700	.1310	.....	
104,160	1,750	.1380	.....	
107,136	1,800	.1448	.....	
110,112	1,850	.1523	.....	
113,088	1,900	.1580	.....	Cracks near ends of pier.
116,064	1,950	.1658	.....	
119,040	2,000	.1760	.....	
122,016	2,050	.1930	.....	Ultimate strength.

No. 854.

8-*inch brick pier.*

Built of twenty courses of face brick.
Total weight, 215 pounds.
Weight per cubic foot, 129.7 pounds.
Total height, 48″.
Sectional area, 7″.75×7″.70=59.68 square inches.
Average thickness of joints, ″.22.
Gauged length, 40″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,968	100	0.	0.	Initial load.
8,952	150	.0019	.....	
11,936	200	.0039	.....	
14,920	250	.0061	.....	
17,904	300	.0088	.....	
20,888	350	.0121	.....	
23,872	400	.0153	.....	
26,856	450	.0193	.....	
29,840	500	.0243	.0108	
32,824	550	.0298	.....	
35,808	600	.0342	.....	
38,792	650	.0396	.....	
41,776	700	.0467	.....	
44,760	750	.0533	.....	
47,744	800	.0590	.....	
50,728	850	.0662	.....	
53,712	900	.0730	.....	
56,696	950	.0806	.....	
59,680	1,000	.0887	.0523	
62,664	1,050	.0990	.....	
65,648	1,100	.1025	.....	
68,632	1,150	.1097	.....	
71,616	1,200	.1165	.....	
74,600	1,250	.1217	.....	
77,584	1,300	.1292	.....	
80,568	1,350	.1350	.....	
83,552	1,400	.1417	.....	
86,536	1,450	.1498	.....	Rested 3 minutes.
89,520	1,500	.1612	.....	
92,504	1,550	.1648	.....	
95,488	1,600	.1702	.....	Rested 2 minutes.
98,472	1,650	.1800	.....	
101,456	1,700	.1850	.....	
104,440	1,750	.1931	.....	
107,424	1,800	.2017	.....	
110,408	1,850	.2085	.....	
113,392	1,900	.2226	.....	Cracks appear in middle courses.
116,000	1,944	.....	.....	Ultimate strength.

No. 855.

8-inch brick pier.

Built of thirty courses of face brick.
Total weight, 321 pounds.
Weight per cubic foot, 127.6 pounds.
Total height, 72″.37.
Sectional area, 7″.75 × 7″.75 = 60.06 square inches.
Average thickness of joints, ″.22.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,009	150	0.	0.	Initial load.
12,012	200	.0000	.....	
15,015	250	.0025	.....	
18,018	300	.0050	.....	
21,021	350	.0090	.....	
24,024	400	.0140	.....	
27,027	450	.0220	.....	
30,030	500	.0290	.0130	
33,033	550	.0380	.....	
36,036	600	.0450	.....	
39,039	650	.0560	.....	
42,042	700	.0660	.0395	
45,045	750	.0793	.....	
48,048	800	.0885	.....	
51,051	850	.1015	.....	
54,054	900	.1130	.....	
57,057	950	.1250	.....	
60,060	1,000	.1370	.0935	
63,063	1,050	.1530	.....	
66,066	1,100	.1620	.....	
69,069	1,150	.1740	.....	
72,072	1,200	.1890	.....	
75,075	1,250	.2015	.....	
78,078	1,300	.2135	.....	
81,081	1,350	.2260	.....	
84,084	1,400	.2410	.....	
87,087	1,450	.2530	.....	Cracks in sight.
90,090	1,500	.2650	.....	
93,093	1,550	.2790	.....	
96,096	1,600	.2900	.....	
99,099	1,650	.3020	.....	
102,102	1,700	.3190	.....	
105,105	1,750	.3310	.....	
108,108	1,800	.3440	.....	
111,111	1,850	.3580	.....	
114,114	1,900	.3740	.....	
117,117	1,950	.3940	.....	Ultimate strength.

Principal fractures confined to the lower half of the pier.

No. 858.

8-inch brick pier.

Built of fifty courses of face brick.
Total height, 119″.27.
Sectional area, 7″.80 × 7″.70 = 60.06 square inches.
Average thickness of joints, ″.23.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,159	152	0.	.....	Initial load.
12,212	203	.0039	.....	
15,265	254	.0068	.....	
18,318	305	.0134	.....	
21,371	356	.0230	.....	
24,424	407	.0363	.....	
27,477	457	.0519	.....	
30,530	508	.0703	.0412	
33,583	559	.0903	.....	
36,636	609	.1078	.....	
39,689	660	.1260	.....	
42,742	712	.1455	.0958	
45,795	762	.1725	.....	
48,848	813	.1880	.....	
51,901	864	.2080	.....	
54,954	915	.2287	.....	
58,007	966	.2498	.....	
61,060	1,017	.2710	.1910	
64,113	1,067	.2976	.....	
67,166	1,118	.3130	.....	
70,219	1,169	.3300	.....	
73,272	1,220	.3539	.....	
76,325	1,271	.3830	.....	
79,378	1,322	.3990	.....	
82,431	1,372	.4147	.....	
85,484	1,423	.4412	.....	
88,537	1,474	.4620	.....	
91,590	1,525	.4750	.....	
94,643	1,576	.5110	.....	Cracks in sight.
97,696	1,627	.5300	.....	
100,749	1,677	.5650	.....	Ultimate strength.

Opened longitudinal seams and crushed the bricks in four courses just above the middle of the height of the pier. The pier deflected downward.

No. 859.

8-inch brick pier.

Built of fifty courses of face brick.
Total weight, 539 pounds.
Weight per cubic foot, 126.8 pounds.
Total height, 120″.37.
Sectional area, 7″.82 × 7″.80 = 61.00 square inches.
Average thickness of joints, ″.22.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,150	150	0.	0.	Initial load.
12,200	200	.0039	.....	
15,250	250	.0081	.....	
18,300	300	.0128	.....	
21,350	350	.0220	.....	
24,400	400	.0360	.....	
27,450	450	.0485	.....	
30,500	500	.0691	.0420	
33,550	550	.0862	.....	
36,600	600	.1030	.....	
39,650	650	.1240	.....	
42,700	700	.1460	.1000	
45,750	750	.1710	.....	
48,800	800	.1865	.....	
51,850	850	.2117	.....	
54,900	900	.2300	.....	
57,950	950	.2500	.....	
61,000	1,000	.2735	.....	
64,050	1,050	.2930	.....	
67,100	1,100	.3123	.....	
70,150	1,150	.3390	.....	
73,200	1,200	.3567	.....	
76,250	1,250	.3775	.....	
79,300	1,300	.3900	.....	
82,350	1,350	.4120	.....	
85,400	1,400	.4420	.....	
88,450	1,450	.4580	.....	
91,500	1,500	.4728	.....	Cracks in third course from bottom.
94,550	1,550	.4948	.....	
97,600	1,600	.5170	.....	
100,650	1,650	.5370	.....	
103,700	1,700	.5580	.....	
106,750	1,750	.5846	.....	
109,800	1,800	.6090	.....	
110,500	1,811	.....	.....	Ultimate strength.

Opened longitudinal seams and deflected upward at middle. Crushed four bricks near the middle of the pier.

No. 860.

12-*inch brick pier.*

Built of thirty courses of face brick, with core of common brick.
Total weight, 706 pounds.
Weight per cubic foot, 126.4 pounds.
Total height, 71″.68.
Sectional area, 11″.6 × 11″.6 = 134.56 square inches.
Average thickness of joints, ″.24.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,456	100	0.	0.	Initial load.
20,184	150	.0018	.....	
26,912	200	.0035	.....	
33,640	250	.0058	.....	
40,368	300	.0084	.....	
47,096	350	.0110	.....	
53,824	400	.0135	.....	
60,552	450	.0165	.....	
67,280	500	.0198	.0043	
74,008	550	.0230	.....	
80,736	600	.0260	.....	
87,464	650	.0298	.....	
94,192	700	.0340	.0090	
100,920	750	.0375	.....	
107,648	800	.0416	.....	
114,376	850	.0450	.....	
121,104	900	.0496	.....	
127,832	950	.0540	.....	
134,560	1,000	.0595	.0185	
141,288	1,050	.0664	.....	
148,016	1,100	.0710	.....	
154,744	1,150	.0765	.....	
161,472	1,200	.0821	.....	
168,200	1,250	.0865	.....	
174,928	1,300	.0940	.....	
181,656	1,350	.1005	.....	
188,384	1,400	.1070	.....	
195,112	1,450	.1137	.....	
201,840	1,500	.1200	.....	
208,568	1,550	.1300	.....	
215,296	1,600	.1380	.....	
222,024	1,650	.1440	.....	Cracks in sight.
228,752	1,700	.1520	.....	A brick in tenth course from bottom begins to crush.
235,480	1,750	.1635	.....	
242,208	1,800	.1695	.....	
248,936	1,850	.1810	.....	
255,664	1,900	.1950	.....	
257,300	1,912	.2100	.....	Ultimate strength.

No. 861

12-inch brick pier.

Built of thirty courses of face brick.
Total weight, 707 pounds.
Weight per cubic foot, 129 pounds.
Total height, 71″.27.
Sectional area, 11″.504×11″.55=132.82 square inches.
Average thickness of joints, ″.23.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13, 282	100	0.	0.	Initial load.
19, 923	150	.0019	.....	
26, 564	200	.0040	.....	
33, 205	250	.0065	.....	
39, 846	300	.0085	.....	
46, 487	350	.0105	.....	
53, 128	400	.0135	.....	
59, 769	450	.0158	.....	
66, 410	500	.0182	.0046	
73, 051	550	.0217	.....	
79, 692	600	.0245	.....	
86, 333	650	.0275	.....	
92, 974	700	.0310	.0080	
99, 615	750	.0350	.....	
106, 256	800	.0380	.....	
112, 897	850	.0415	.....	
119, 538	900	.0455	.....	
126, 179	950	.0498	.....	
132, 820	1, 000	.0540	.0154	
139, 461	1, 050	.0605	.....	
146, 102	1, 100	.0647	.....	
152, 743	1, 150	.0696	.....	
159, 384	1, 200	.0745	.....	
166, 025	1, 250	.0785	.....	
172, 666	1, 300	.0850	.....	
179, 307	1, 350	.0910	.....	
185, 948	1, 400	.0972	.....	
192, 589	1, 450	.1030	.....	
199, 230	1, 500	.1090	.....	
205, 871	1, 550	.1175	.....	Crack in third course from bottom.
212, 512	1, 600	.1260	.....	
219, 153	1, 650	.1340	.....	
225, 794	1, 700	.1395	.....	
232, 435	1, 750	.1490	.....	A brick in the seventeenth course from bottom begins to crush.
239, 076	1, 800	.1580	.....	
245, 717	1, 850	.1670	.....	
252, 358	1, 900	.1775	.....	
258, 100	1, 943	.1940	.....	Ultimate strength.

Partially crushed bricks in five upper courses.

No. 862.

12-inch hollow brick pier.

Built of thirty courses of face brick.
Total weight, 619 pounds.
Weight per cubic foot, 130.3 pounds.

Cross-section dimensions..... 11″.50 × 11″.55 = 132.83 square inches.
Core ..... 4″.1 × 4″.2 = 17.22

Sectional area of pier 115.61
Total height, 71″.
Average thickness of joints, ″.22.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
11, 561	100	0.	0.	Initial load.
17, 342	150	.0016	.....	
23, 122	200	.0036	.....	
28, 903	250	.0061	.....	
34, 683	300	.0086	.....	
40, 464	350	.0117	.....	
46, 245	400	.0151	.....	
52, 026	450	.0184	.....	Rested 5 minutes.
57, 805	500	.0222	.0054	
63, 586	550	.0264	.....	
69, 366	600	.0304	.....	
75, 147	650	.0350	.....	
80, 927	700	.0394	.....	
86, 708	750	.0438	.0144	
92, 488	800	.0503	.....	
98, 269	850	.0556	.....	
104, 049	900	.0603	.....	
109, 830	950	.0660	.....	
115, 610	1, 000	.0724	.0282	
121, 391	1, 050	.0803	.....	
127, 171	1, 100	.0858	.....	
132, 952	1, 150	.0910	.....	
138, 732	1, 200	.0982	.....	
144, 513	1, 250	.1044	.....	
150, 293	1, 300	.1112	.....	
156, 074	1, 350	.1193	.....	
161, 854	1, 400	.1270	.....	
167, 635	1, 450	.1350	.....	
173, 415	1, 500	.1422	.....	
179, 196	1, 550	.1503	.....	Cracks in sight.
184, 976	1, 600	.1602	.....	
190, 757	1, 650	.1693	.....	
196, 537	1, 700	.1776	.....	
202, 318	1, 750	.1880	.....	
208, 098	1, 800	.1975	.....	
213, 879	1, 850	.2145	.....	
219, 659	1, 900	.2410	.....	Ultimate strength.

Crushed bricks along middle courses.

No. 863.

16-*inch brick pier.*

Built of thirty courses of face brick.
Total weight, 1,250 pounds.
Weight per cubic foot, 129.5 pounds.
Total height, 70″.09.
Sectional area, 15″.40 × 15″.40 = 237.93 square inches.
Average thickness of joints, ″.24.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
23,793	100	0.	0.	Initial load.
35,690	150	.0015	.....	
47,586	200	.0032	.....	
59,483	250	.0054	.....	
71,379	300	.0077	.....	
83,276	350	.0101	.....	
95,172	400	.0122	.....	
107,069	450	.0154	.....	
118,965	500	.0182	.0032	
130,862	550	.0212	.....	
142,758	600	.0236	.....	
154,655	650	.0264	.....	
166,551	700	.0295	.0056	
178,448	750	.0329	.....	
190,344	800	.0359	.....	
202,241	850	.0393	.....	
214,137	900	.0428	.....	
226,034	950	.0466	.....	
237,930	1,000	.0499	.0111	
249,827	1,050	.0548	.....	
261,723	1,100	.0582	.....	
273,620	1,150	.0619	.....	
285,516	1,200	.0657	.....	
297,413	1,250	.0698	.....	
309,309	1,300	.0746	.....	
321,206	1,350	.0789	.....	
333,102	1,400	.0836	.....	
344,999	1,450	.0892	.....	
356,895	1,500	.0942	.....	
368,792	1,550	.0995	.....	
380,688	1,600	.1050	.....	
392,585	1,650	.1100	.....	Cracks in end courses.
404,481	1,700	.1188	.....	
416,378	1,750	.1242	.....	
428,274	1,800	.1300	.....	
440,171	1,850	.1378	.....	
452,067	1,900	.1465	.....	
463,964	1,950	.1575	.....	
475,860	2,000	.1665	.....	
487,757	2,050	.1795	.....	
499,653	2,100	.....	.....	Ultimate strength.

Partially crushed the bricks; the most injury being done the ends of the pier.

No. 864.

16-*inch brick pier.*

Built of thirty courses of face brick with common brick core.
Total weight, 1,243 pounds.
Weight per cubic foot, 126.1 pounds.
Total height, 71″.44.
Sectional area, 15″.35 × 15″.45 = 237.16 square inches.
Average thickness of joints, ″.22.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
23,716	100	0.	0.	Initial load.
35,574	150	.0018	.....	
47,432	200	.0040	.....	
59,290	250	.0068	.....	
71,148	300	.0093	.....	
83,006	350	.0120	.....	
94,864	400	.0149	.....	
106,722	450	.0175	.....	
118,580	500	.0212	.0050	
130,438	550	.0246	.....	
142,296	600	.0278	.....	
154,154	650	.0309	.....	
166,012	700	.0349	.0089	
177,870	750	.0390	.....	
189,728	800	.0420	.....	
201,586	850	.0457	.....	
213,444	900	.0495	.....	
225,302	950	.0528	.....	
237,160	1,000	.0570	.0150	
249,018	1,050	.0625	.....	
260,876	1,100	.0661	.....	
272,734	1,150	.0705	.....	
284,592	1,200	.0752	.....	
296,450	1,250	.0800	.....	
308,308	1,300	.0845	.....	
320,166	1,350	.0895	.....	
332,024	1,400	.0940	.....	
343,882	1,450	.0991	.....	End course at top of pier cracked.
355,740	1,500	.1074	.....	Crack in eighth course from top.
367,598	1,550	.1130	.....	
379,456	1,600	.1215	.....	
391,314	1,650	.1272	.....	
403,172	1,700	.1337	.....	
415,030	1,750	.1395	.....	
426,888	1,800	.1458	.....	
438,746	1,850	.1560	.....	
450,604	1,900	.1645	.....	
462,462	1,950	.1780	.....	
468,700	1,976	.1950	.....	Ultimate strength.

Partially crushed the bricks in the upper half of the pier.

No. 865.

8-inch brick pier.

Built of nine courses of common brick.
Total weight, 92 pounds.
Weight per cubic foot, 120.8 pounds.
Total height, 22″.87.
Sectional area, 7″.52×7″.65=57.53 square inches.
Average thickness of joints, ″.30.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
115,000	.....	.....	.....	Cracks.
161,000	2,798	.....	.....	Ultimate strength.

No. 866.

8-inch brick pier.

Built of nine courses of common brick.
Total weight, 96 pounds.
Weight per cubic foot, 123.3 pounds.
Total height, 23″.13.
Sectional area, 7″.60×7″.65=58.14 square inches.
Average thickness of joints, ″.26.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
68,000	.....	.....	.....	Cracks.
157,800	2,714	.....	.....	Ultimate strength.

Opened longitudinal seams and crushed the bricks.

No. 867.

8-inch brick pier.

Built of nineteen courses of common brick.
Total weight, 202 pounds.
Weight per cubic foot, 125.4 pounds.
Total height, 48″.37.
Sectional area, 7″.55×7″.60=57.38 square inches.
Average thickness of joints, ″.27.
Gauged length, 40″.
Pier cracked at middle in transportation.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,733	100	0.	0.	Initial load.
8,607	150	.0073	----------	
11,476	200	.0129	----------	
14,345	250	.0168	----------	
17,214	300	.0190	----------	
20,083	350	.0228	----------	
22,952	400	.0253	----------	
25,821	450	.0280	----------	
28,690	500	.0307	.0193	
31,559	550	.0328	----------	
34,428	600	.0365	----------	
37,297	650	.0392	----------	
40,166	700	.0426	----------	
43,035	750	.0450	----------	
45,904	800	.0490	----------	
48,773	850	.0525	----------	
51,642	900	.0563	----------	
54,511	950	.0603	----------	
57,380	1,000	.0646	.0380	
60,249	1,050	.0711	----------	
63,118	1,100	.0740	----------	
65,987	1,150	.0764	----------	
68,856	1,200	.0825	----------	
71,725	1,250	.0896	----------	
74,594	1,300	.0946	----------	
77,463	1,350	.0990	----------	
80,332	1,400	.1047	----------	Cracks in upper courses.
83,201	1,450	.1109	----------	
86,070	1,500	.1168	----------	
88,939	1,550	.1209	----------	
91,808	1,600	.1280	----------	
94,677	1,650	.1370	----------	
97,546	1,700	.1430	----------	
100,415	1,750	.1500	----------	
103,284	1,800	.1556	----------	
106,153	1,850	.1635	----------	
108,722	1,900	.1712	----------	
112,891	1,950	.2042	----------	Ultimate strength.

No. 868.

8-inch brick pier.

Built of nineteen courses of common brick.
Total weight, 200 pounds.
Weight per cubic foot, 124.6 pounds.
Total height, 47″.62.
Sectional area, 7″.68 × 7″.58 = 58.21 square inches.
Average thickness of joints, ″.25.
Gauged length, 40″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,821	100	0.	0.	Initial load.
8,731	150	.0012	.....	
11,642	200	.0028	.....	
14,552	250	.0044	.....	
17,463	300	.0061	.....	
20,373	350	.0077	.....	
23,284	400	.0098	.....	
26,194	450	.0119	.....	
29,105	500	.0143	.0027	
32,015	550	.0170	.....	
34,926	600	.0190	.....	
37,836	650	.0215	.....	
40,747	700	.0246	.....	
43,657	750	.0278	.....	
46,568	800	.0312	.....	
49,478	850	.0351	.....	
52,389	900	.0391	.....	
55,299	950	.0423	.....	
58,210	1,000	.0476	.0179	
61,120	1,050	.0546	.....	
64,031	1,100	.0582	.....	
66,941	1,150	.0622	.....	
69,852	1,200	.0679	.....	
72,762	1,250	.0724	.....	
75,673	1,300	.0798	.....	
78,583	1,350	.0860	.....	
81,494	1,400	.0920	.....	
84,404	1,450	.0980	.....	
87,315	1,500	.1100	.....	
90,225	1,550	.1186	.....	Cracks.
93,136	1,600	.1250	.....	
96,046	1,650	.1350	.....	
98,957	1,700	.1528	.....	
101,867	1,750	.1695	.....	Ultimate strength.

No. 869.

8-inch brick pier.

Built of twenty-nine courses of common brick.
Total weight, 301 pounds.
Weight per cubic foot, 121.5 pounds.
Total height, 73″.62.
Sectional area, 7″.65 × 7″.60 = 58.14 square inches.
Average thickness of joints, ″.26.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,721	150	0.	0.	Initial load.
11,628	200	.0016	.....	
14,535	250	.0033	.....	
17,442	300	.0055	.....	
20,349	350	.0075	.....	
23,256	400	.0097	.....	
26,163	450	.0132	.....	
29,070	500	.0147	.0032	
31,977	550	.0174	.....	
34,884	600	.0198	.....	
37,791	650	.0222	.....	
40,698	700	.0251	.0060	
43,605	750	.0285	.....	
46,512	800	.0310	.....	
49,419	850	.0341	.....	
52,326	900	.0370	.....	
55,233	950	.0396	.....	
58,140	1,000	.0435	.0118	
61,047	1,050	.0475	.....	
63,954	1,100	.0504	.....	
66,861	1,150	.0540	.....	
69,768	1,200	.0592	.....	
72,675	1,250	.0630	.....	
75,582	1,300	.0665	.....	
78,489	1,350	.0710	.....	
81,396	1,400	.0735	.....	
84,303	1,450	.0785	.....	
87,210	1,500	.0838	.....	
90,117	1,550	.0875	.....	
93,024	1,600	.0930	.....	
95,931	1,650	.0998	.....	
98,838	1,700	.1040	.....	
101,745	1,750	.1095	.....	Cracks in middle courses.
104,652	1,800	.1130	.....	
107,559	1,850	.1210	.....	
110,466	1,900	.1270	.....	
113,373	1,950	.1325	.....	
116,280	2,000	.1380	.....	
119,187	2,050	.1511	.....	
122,094	2,100	.1575	.....	
125,001	2,150	.1665	.....	
127,908	2,200	.1730	.....	
130,815	2,250	.1790	.....	
133,722	2,300	.1885	.....	
136,629	2,350	.2005	.....	
139,536	2,400	.2125	.....	
142,443	2,450	.2275	.....	
144,300	2,481	.2410	.....	Ultimate strength.

No. 870.

8-*inch brick pier.*

Built of twenty-nine courses of common brick.
Total weight, 301 pounds.
Weight per cubic foot, 123.3 pounds.
Total height, 73″.18.
Sectional area, 7″.60×7.″58=57.61 square inches.
Average thickness of joints, ″.28.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,642	150	0.	0.	Initial load.
11,522	200	.0015	.....	
14,403	250	.0030	.....	
17,283	300	.0051	.....	
20,164	350	.0078	.....	
23,044	400	.0105	.....	
25,925	450	.0135	.....	
28,805	500	.0168	.0032	
31,686	550	.0200	.....	
34,566	600	.0230	.....	
37,447	650	.0258	.....	
40,327	700	.0290	.0075	
43,208	750	.0330	.....	
46,088	800	.0370	.....	
48,969	850	.0395	.....	
51,849	900	.0430	.....	
54,730	950	.0480	.....	
57,610	1,000	.0520	.0165	
60,491	1,050	.0570	.....	
63,371	1,100	.0600	.....	
66,252	1,150	.0640	.....	
69,132	1,200	.0710	.....	
72,013	1,250	.0750	.....	
74,893	1,300	.0805	.....	
77,774	1,350	.0860	.....	
80,654	1,400	.0895	.....	
83,535	1,450	.0960	.....	Cracks.
86,415	1,500	.1050	.....	
89,296	1,550	.1100	.....	
92,176	1,600	.1145	.....	
95,057	1,650	.1240	.....	
97,937	1,700	.1340	.....	
100,818	1,750	.1430	.....	
103,698	1,800	.1520	.....	
106,579	1,850	.1610	.....	
109,459	1,900	.1705	.....	
112,340	1,950	.1780	.....	
115,220	2,000	.1853	.....	
118,101	2,050	.1950	.....	
120,981	2,100	.2090	.....	
123,862	2,150	.2210	.....	
126,742	2,200	.2310	.....	
129,623	2,250	.2420	.....	
132,503	2,300	.2650	.....	Ultimate strength.

Principal fractures confined to the upper courses of bricks. Partially crushed the bricks in the seventh course.

No. 871.

8-inch brick pier.

Built of thirty-nine courses of common brick.
Total weight, 400 pounds.
Weight per cubic foot, 121.4 pounds.
Total height, 97″.50.
Sectional area, 7″.65 × 7″.63 = 58.37 square inches.
Average thickness of joints, ″.30.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,756	150	0.	0.	Initial load.
11,674	200	.0031	.....	
14,593	250	.0070	.....	
17,511	300	.0130	.....	
20,430	350	.0220	.....	
23,348	400	.0320	.....	
26,267	450	.0445	.....	
29,185	500	.0580	.0370	
32,104	550	.0725	.....	
35,022	600	.0860	.....	
37,941	650	.1020	.....	
40,859	700	.1180	.0825	
43,777	750	.1390	.....	
46,696	800	.1525	.....	
49,615	850	.1700	.....	
52,533	900	.1880	.....	
55,452	950	.2090	.....	
58,370	1,000	.2290	.1685	
61,289	1,050	.2540	.....	
64,207	1,100	.2670	.....	
67,126	1,150	.2940	.....	
70,044	1,200	.3090	.....	
72,963	1,250	.3280	.....	Cracks in sight.
75,881	1,300	.3500	.....	
78,800	1,350	.3690	.....	
81,718	1,400	.3925	.....	
84,636	1,450	.4110	.....	
87,555	1,500	.4360	.....	
90,474	1,550	.....	.....	Ultimate strength.

Principal failure in thirteenth, fourteenth, and fifteenth courses from the bottom, where the bricks partially crushed. Opened longitudinal seams.

No. 872.

8-inch brick pier.

Built of thirty-eight courses of common brick.
Total weight, 387 pounds.
Weight per cubic foot, 121.4 pounds.
Total height, 95″.98.
Sectional area, 7″.60 × 7″.55 = 57.38 square inches.
Average thickness of joints, ″.30.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,607	150	0.	0.	Initial load.
11,476	200	.0030	.....	
14,345	250	.0090	.....	
17,214	300	.0185	.....	
20,083	350	.0284	.....	
22,952	400	.0410	.....	
25,821	450	.0570	.....	
28,690	500	.0725	.0493	
31,559	550	.0880	.....	
34,428	600	.1070	.....	
37,297	650	.1240	.....	
40,160	700	.1485	.1115	
43,035	750	.1700	.....	
45,904	800	.1860	.....	
48,773	850	.2050	.....	
51,642	900	.2300	.....	
54,511	950	.2518	.....	
57,380	1,000	.2825	.2210	
60,249	1,050	.3040	.....	
63,118	1,100	.3235	.....	
65,987	1,150	.3390	.....	
68,856	1,200	.3660	.....	
71,725	1,250	.3910	.....	Cracks in sight.
74,594	1,300	.4160	.....	
77,463	1,350	.4440	.....	
80,332	1,400	.4845	.....	
83,201	1,450	.5080	.....	
86,070	1,500	.5420	.....	
90,800	1,582	.....	.....	Ultimate strength.

No. 873.

8-inch brick pier.

Built of forty-eight courses of common brick.
Total weight, 486 pounds.
Weight per cubic foot, 121 pounds.
Total height, 120″.93.
Sectional area, 7″.55 × 7″.60 = 57.38 square inches.
Average thickness of joints, ″.30.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,607	150	0.	0.	Initial load.
11,476	200	.0021	.....	
14,345	250	.0061	.....	
17,214	300	.0110	.....	
20,083	350	.0198	.....	
22,952	400	.0350	.....	
25,821	450	.0520	.....	
28,690	500	.0786	.0515	
31,559	550	.0959	.....	
34,428	600	.1140	.....	
37,297	650	.1390	.....	
40,166	700	.1600	.1160	
43,035	750	.1860	.....	
45,904	800	.2100	.....	
48,773	850	.2337	.....	
51,642	900	.2645	.....	Cracks in upper courses.
54,511	950	.2920	.....	
57,380	1,000	.3150	.....	
60,249	1,050	.3390	.....	
63,118	1,100	.3770	.....	
65,987	1,150	.4020	.....	
68,856	1,200	.4370	.....	
71,725	1,250	.4650	.....	
74,594	1,300	.4870	.....	
77,463	1,350	.5220	.....	
80,332	1,400	.5500	.....	
83,201	1,450	.5970	.....	
86,070	1,500	.....	.....	Ultimate strength.

Principal fractures confined to the upper thirteen courses.

No. 874.

8-inch brick pier.

Built of forty-nine courses of common brick.
Total weight, 496 pounds.
Weight per cubic foot, 123.1 pounds.
Total height, 121″.31.
Sectional area, 7″.55×7″.60=57.38 square inches.
Average thickness of joints, ″.28.
Ganged length, 100″.

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,607	150	0.	0.	Initial load.
11,476	200	.0035	.....	
14,345	250	.0075	.....	
17,214	300	.0140	.....	
20,083	350	.0250	.....	
22,952	400	.0380	.....	
25,821	450	.0500	.....	
28,690	500	.0685	.0425	
31,559	550	.0840	.....	
34,428	600	.1020	.....	
37,297	650	.1210	.....	
40,166	700	.1430	.1000	
43,035	750	.1645	.....	
45,904	800	.1850	.....	
48,773	850	.2050	.....	
51,642	900	.2300	.....	
54,511	950	.2500	.....	
57,380	1,000	.2780	.2082	
60,249	1,050	.3035	.....	
63,118	1,100	.3215	.....	
65,987	1,150	.3470	.....	
68,856	1,200	.3660	.....	
71,725	1,250	.3860	.....	Cracks in upper courses.
74,594	1,300	.4100	.....	
77,463	1,350	.4360	.....	
80,332	1,400	.4600	.....	
83,201	1,450	.4870	.....	
86,070	1,500	.5090	.....	
88,939	1,550	.5370	.....	
91,808	1,600	.5740	.....	
94,677	1,650	.5930	.....	
97,546	1,700	.6400	.....	
100,415	1,750	.6770	.....	
103,284	1,800	.7250	.....	
104,200	1,815	.....	.....	Ultimate strength.

Opened longitudinal seams and partially crushed the bricks in the upper half of the pier.

No. 875.

12-*inch brick pier.*

Built of nine courses of common brick.
Total weight, 218 pounds.
Weight per cubic foot, 123.5 pounds.
Total height, 23″.06.
Sectional area, 11″.60 × 11″.40 = 132.24 square inches.
Average thickness of joints, ″.25.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
175,000	.....	.....	.....	Cracks.
307,890	2,329	.....	.....	Ultimate strength.

No. 876.

12-*inch brick pier.*

Built of nine courses of common brick.
Total weight, 214 pounds.
Weight per cubic foot, 125.8 pounds.
Total height, 22″.75.
Sectional area, 11″.35×11″.38=129.16 square inches.
Average thickness of joints, ″.25.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
210,000	.....	.....	.....	Cracks.
318,500	2,466	.....	.....	Ultimate strength.

No. 877.

12-*inch brick pier.*

Built of nineteen courses of common brick.
Total weight, 457 pounds.
Weight per cubic foot, 124.9 pounds.
Total height, 47″.58.
Sectional area, 11″.50 × 11″.55 = 132.83 square inches.
Average thickness of joints, ″.25.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,283	100	0.	0.	Initial load.
19,925	150	.0010	.....	
26,566	200	.0038	.....	
33,208	250	.0048	.0008	
39,849	300	.0060	.....	
46,491	350	.0085	.....	
53,132	400	.0104	.....	
59,774	450	.0125	.....	
66,415	500	.0155	.0040	
73,057	550	.0175	.....	
79,698	600	.0205	.....	
86,340	650	.0220	.....	
92,801	700	.0260	.0075	
99,623	750	.0280	.....	
106,264	800	.0305	.....	
112,906	850	.0335	.....	
119,547	900	.0380	.....	
126,189	950	.0408	.....	
132,830	1,000	.0445	.0165	
139,472	1,050	.0490	.....	
146,113	1,100	.0515	.....	
152,755	1,150	.0545	.....	Cracks in sight.
159,396	1,200	.0580	.....	
166,038	1,250	.0640	.....	
172,679	1,300	.0670	.....	
179,321	1,350	.0715	.....	
185,962	1,400	.0760	.....	
192,603	1,450	.0817	.....	
199,245	1,500	.0875	.....	
205,886	1,550	.0950	.....	
212,528	1,600	.1090	.....	
219,170	1,650	.1260	.....	
224,100	1,687	.1340	.....	Ultimate strength.

No. 878.

12-inch brick pier.

Built of nineteen courses of common brick.
Total weight, 446 pounds.
Weight per cubic foot, 125.1 pounds.
Total height, 47″.81.
Sectional area, 11″.30×11″.40=128.82 square inches.
Average thickness of joints, ″.28.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
12, 882	100	0.	0.	Initial load.
19, 323	150	.0018	.....	
25, 764	200	.0037	.....	
32, 205	250	.0054	.....	
38, 646	300	.0072	.....	
45, 807	350	.0092	.....	
51, 528	400	.0111	.....	
57, 969	450	.0132	.....	
64, 410	500	.0154	.0042	
70, 851	550	.0176	.....	
77, 292	600	.0197	.....	
83, 733	650	.0218	.....	
90, 174	700	.0240	.....	
96, 615	750	.0266	.....	
103, 056	800	.0290	.....	
109, 497	850	.0319	.....	
115, 938	900	.0340	.....	
122, 379	950	.0367	.....	
128, 820	1, 000	.0390	.0117	
135, 261	1, 050	.0435	.....	
141, 702	1, 100	.0456	.....	
148, 143	1, 150	.0478	.....	
154, 584	1, 200	.0508	.....	
161, 025	1, 250	.0541	.....	
167, 466	1, 300	.0574	.....	
173, 907	1, 350	.0607	.....	
180, 348	1, 400	.0636	.....	
186, 789	1, 450	.0668	.....	
193, 230	1, 500	.0710	.....	
199, 671	1, 550	.0755	.....	
206, 112	1, 600	.0790	.....	
212, 553	1, 650	.0842	.....	
218, 994	1, 700	.0880	.....	Cracks in sight.
225, 435	1, 750	.0936	.....	
231, 876	1, 800	.0980	.....	
238, 317	1, 850	.1050	.....	
244, 758	1, 900	.1160	.....	
251, 199	1, 950	.1265	.....	Ultimate strength.

No. 879.

12-inch brick pier.

Built of twenty-nine courses of common brick.
Total weight, 680 pounds.
Weight per cubic foot, 123.2 pounds.
Total height, 72″.75.
Sectional area, 11″.45 × 11″.45 = 131.10 square inches.
Average thickness of joints, ″.25.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,110	100	0.	0.	Initial load.
19,665	150	.0000	.....	
26,220	200	.0019	.....	
32,775	250	.0045	.....	
39,330	300	.0075	.....	
45,885	350	.0105	.....	
52,440	400	.0140	.....	
58,995	450	.0182	.....	
65,550	500	.0221	.0060	
72,105	550	.0270	.....	
78,660	600	.0325	.....	
85,215	650	.0388	.....	
91,770	700	.0435	.0170	
98,325	750	.0490	.....	
104,880	800	.0545	.....	
111,435	850	.0605	.....	
117,990	900	.0690	.....	
124,545	950	.0770	.....	
131,100	1,000	.0835	.0410	
137,655	1,050	.0958	.....	
144,210	1,100	.1045	.....	Cracks in sight.
150,765	1,150	.1135	.....	
157,320	1,200	.1195	.....	
163,875	1,250	.1320	.....	
170,430	1,300	.1435	.....	
176,985	1,350	.1555	.....	
183,540	1,400	.1690	.....	
190,095	1,450	.1800	.....	
196,650	1,500	.1920	.....	
203,205	1,550	.2070	.....	
209,760	1,600	.2180	.....	
216,315	1,650	.2310	.....	
222,870	1,700	.2530	.....	Ultimate strength.

No. [illegible].

[illegible] brick pier.

Built of [illegible] courses of common brick.
Brick weight [illegible] pounds.
Weight per cubic foot [illegible] pounds.
[illegible]
[illegible] = [illegible] square inches.
[illegible]

Original dimensions.		In gauged length.		Remarks.
Diam.	Perimeter.	Increase.	Set.	
Inches.	Inches.	Inch.	Inch.	
[illegible]	[illegible]	[illegible]	[illegible]	Initial load.
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	Rested 3 minutes.
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	Cracks in sight.
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	Ultimate strength.

No. 881.

12-inch brick pier.

Built of thirty-eight courses of common brick.
Total weight, 895 pounds.
Weight per cubic foot, 121.6 pounds.
Total height, 97″.37.
Sectional area, 11″.40 × 11″.45=130.53 square inches.
Average thickness of joints, ″.27.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19, 580	150	0.	0.	Initial load.
26, 106	200	.0029	.....	
32, 633	250	.0072	.....	
39, 159	300	.0140	.....	
45, 686	350	.0186	.....	
52, 212	400	.0267	.....	
58, 739	450	.0340	.....	
65, 265	500	.0445	.0238	
71, 792	550	.0540	.....	
78, 318	600	.0630	.....	
84, 845	650	.0750	.....	
91, 371	700	.0895	.0555	
97, 898	750	.1050	.....	
104, 424	800	.1160	.....	
110, 950	850	.1330	.....	
117, 477	900	.1495	.....	
124, 004	950	.1695	.....	
130, 530	1, 000	.1830	.1270	
137, 057	1, 050	.2050	.....	Cracks in upper half of pier.
143, 583	1, 100	.2240	.....	
150, 110	1, 150	.2420	.....	
156, 636	1, 200	.2620	.....	
163, 163	1, 250	.2820	.....	
169, 690	1, 300	.3110	.....	
176, 216	1, 350	.3400	.....	
182, 742	1, 400	.3700	.....	
185, 400	1, 420	.3860	.....	
190, 700	1, 461	.....	.....	Ultimate strength.

Opened longitudinal seams.

No. 882.

12-inch brick pier.

Built of thirty-eight courses of common brick.
Total weight, 887 pounds.
Weight per cubic foot, 120.8 pounds.
Total height, 95″.75.
Sectional area, 1″.40×11″.50=131.10 square inches.
Average thickness of joints, ″.28.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19,665	150	0.	.0	Initial load.
26,220	200	.0021	.....	
32,775	250	.0050	.....	
39,330	300	.0085	.....	
45,885	350	.0140	.....	
52,440	400	.0185	.....	
58,995	450	.0250	.....	
65,550	500	.0340	.0140	
72,105	550	.0408	.....	
78,660	600	.0490	.....	
85,215	650	.0570	.....	
91,770	700	.0695	.0362	
98,325	750	.0820	.....	
104,880	800	.0910	.....	
111,435	850	.1000	.....	
117,990	900	.1165	.....	
124,545	950	.1280	.....	
131,100	1,000	.1420	.0872	
137,655	1,050	.1635	.....	
144,210	1,100	.1760	.....	Cracks in sight.
150,765	1,150	.1930	.....	
157,320	1,200	.2060	.....	
163,875	1,250	.2240	.....	
170,430	1,300	.2468	.....	
176,985	1,350	.2630	.....	
183,540	1,400	.2900	.....	
190,095	1,450	.3030	.....	
196,650	1,500	.3300	.....	
203,205	1,550	.3525	.....	
209,760	1,600	.3970	.....	
211,100	1,610	.....	.....	Ultimate strength.

No. 883.

12-inch brick pier.

Built of forty-eight courses of common brick.
Total weight, 1,130 pounds.
Weight per cubic foot, 121.9 pounds.
Total height, 121″.0.
Sectional area, 11″.45×11″.55=132.25 square inches.
Average thickness of joints, ″.28.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19,838	150	0.	0.	Initial load.
26,450	200	.0033	.....	
33,063	250	.0064	.....	
39,675	300	.0106	.....	
46,288	350	.0169	.....	
52,900	400	.0244	.....	
59,513	450	.0336	.....	
66,125	500	.0428	.0186	
72,738	550	.0521	.....	
79,350	600	.0607	.....	
85,963	650	.0731	.....	
92,575	700	.0850	.0442	
99,188	750	.0985	.....	
105,800	800	.1150	.....	
112,413	850	.1265	.....	
119,025	900	.1430	.....	
125,638	950	.1610	.....	
132,250	1,000	.1805	.1133	
138,863	1,050	.2065	.....	
145,475	1,100	.2300	.....	Cracks opened.
152,088	1,150	.2537	.....	
158,700	1,200	.2879	.....	
165,313	1,250	.3100	.....	
171,925	1,300	.3690	.....	
178,200	1,347	.....	.....	Ultimate strength.

Principal injury done the middle and upper half of the pier.

No. 884.

12-*inch hollow brick pier.*

Built of nine courses of common brick.
Total weight, 184 pounds.
Weight per cubic foot, 126.2 pounds.
Total height, 23″.
Cross-section dimensions.....11″.4 × 11″.4 = 129.96 square inches.
Core ..... 4″.5 × 4″.5 = 20.48 Do.

Sectional area..... 109.48 Do.
Average thickness of joints, ″.30.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
182,000	.....	.....	.....	Cracks.
271,500	2,480	.....	.....	Ultimate strength.

No. 885.

12-*inch hollow brick pier.*

Built of nine courses of common brick.
Total weight, 201 pounds.
Weight per cubic foot, 127.7 pounds.
Total height, 25″.12.
Cross-section dimension.....11″.40 × 11″.45 = 130.53 square inches.
Core ..... 4″.55 × 4″.9 = 22.30

Sectional area..... 108.23
Average thickness of joints, ″.30.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
138,000	.....	.....	.....	Cracks.
265,400	2,452	.....	.....	Ultimate strength.

No. 886.

12-inch hollow brick pier.

Built of nineteen courses of common brick.
Total weight, 379 pounds.
Weight per cubic foot, 127.3 pounds.
Total length, 48″.18.

Cross-section dimensions.....11″.35×11″.35=128.82 square inches.
Core ..... 4″.70× 4″.70= 22.09 Do.

Sectional area ..... 106.73 Do.

Average thickness of joints, ″.26.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,673	100	0.	0.	Initial load.
16,010	150	.0015	.....	
21,346	200	.0040	.....	
26,683	250	.0060	.....	
32,019	300	.0090	.....	
37,356	350	.0125	.....	
42,692	400	.0160	.....	
48,029	450	.0200	.....	
53,365	500	.0260	.0130	
58,702	550	.0309	.....	
64,038	600	.0360	.....	
69,375	650	.0415	.....	
74,711	700	.0480	.0280	
80,048	750	.0565	.....	
85,384	800	.0620	.....	
90,721	850	.0695	.....	
96,057	900	.0785	.....	
101,394	950	.0855	.....	
106,730	1,000	.0950	.0640	Cracks in sight.
112,067	1,050	.1100	.....	
117,403	1,100	.1165	.....	
122,740	1,150	.1240	.....	
128,076	1,200	.1365	.....	
133,413	1,250	.1445	.....	
138,749	1,300	.1530	.....	
144,086	1,350	.1645	.....	
149,422	1,400	.1750	.....	
154,759	1,450	.1860	.....	
160,095	1,500	.2000	.....	
165,432	1,550	.2110	.....	
170,768	1,600	.2250	.....	
176,105	1,650	.2410	.....	
181,441	1,700	.2530	.....	
186,778	1,750	.2640	.....	
192,114	1,800	.2790	.....	
197,451	1,850	.3000	.....	
198,100	1,856	.....	.....	Ultimate strength.

No. 887.

12-inch hollow brick pier.

Built of nineteen courses of common brick.
Total weight, 383 pounds.
Weight per cubic foot, 127.7 pounds.
Total height, 47″.98.
Cross-section dimensions.....11″.40×11″.45=130.53 square inches.
Core .... 4″.70× 4″.80= 22.56 Do.

Sectional area..... 107.97 Do.
Average thickness of joints, ″.26.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,797	100	0.	0.	Initial load.
16,196	150	.0020	.....	
21,594	200	.0044	.....	
26,993	250	.0071	.....	
32,391	300	.0100	.....	
37,790	350	.0138	.....	
43,188	400	.0168	.....	
48,587	450	.0206	.....	
53,985	500	.0253	.0124	
59,384	550	.0304	.....	
64,782	600	.0346	.....	
70,181	650	.0396	.....	
75,579	700	.0458	.....	
80,978	750	.0527	.....	
86,376	800	.0551	.....	
91,775	850	.0643	.....	
97,173	900	.0730	.....	
102,572	950	.0792	.....	
107,970	1,000	.0865	.....	Cracks in sight.
113,369	1,050	.0933	.....	
118,767	1,100	.0991	.....	
124,166	1,150	.1100	.....	
129,564	1,200	.1185	.....	
134,963	1,250	.1251	.....	
140,361	1,300	.1330	.....	
145,760	1,350	.1425	.....	
151,158	1,400	.1540	.....	
156,557	1,450	.1610	.....	
161,955	1,500	.1690	.....	
167,354	1,550	.1785	.....	
172,752	1,600	.1910	.....	
178,151	1,650	.2020	.....	
183,549	1,700	.2150	.....	
188,948	1,750	.2240	.....	
194,346	1,800	.2362	.....	
199,745	1,850	.2490	.....	
205,143	1,900	.2657	.....	
210,542	1,950	.2915	.....	
215,200	1,993	.3040	.....	Ultimate strength.

No. 888.

12-inch hollow brick pier.

Built of twenty-nine courses of common brick.
Total weight, 557 pounds.
Weight per cubic foot, 124.4 pounds.
Total height, 72″.75.
Cross-section dimensions ..11″.35 × 11″.35 = 128.82 square inches.
Core ..... 4″.9 × 4″.6 = 22.54 Do.

Sectional area ..... 106.28 Do.
Average thickness of joints, ″.28.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,628	100	0.	0.	Initial load.
15,942	150	.0018	.....	
21,256	200	.0041	.....	
26,570	250	.0070	.....	
31,884	300	.0108	.....	
37,198	350	.0151	.....	
42,512	400	.0210	.....	
47,826	450	.0265	.....	
53,140	500	.0330	.0140	
58,454	550	.0105	.....	
63,768	600	.0475	.....	
69,082	650	.0560	.....	
74,396	700	.0645	.0340	
79,710	750	.0760	.....	
85,024	800	.0835	.....	
90,338	850	.0925	.....	
95,652	900	.1050	.....	
100,966	950	.1165	.....	
106,280	1,000	.1295	.0815	
111,594	1,050	.1465	.....	
116,908	1,100	.1570	.....	Cracks in sight.
122,222	1,150	.1680	.....	
127,536	1,200	.1790	.....	
132,850	1,250	.1990	.....	
138,164	1,300	.2090	.....	
143,478	1,350	.2290	.....	
148,792	1,400	.2490	.....	
154,106	1,450	.2680	.....	
162,100	1,525	.....	.....	Ultimate strength.

No. 878.

12-inch brick pier.

Built of nineteen courses of common brick.
Total weight, 446 pounds.
Weight per cubic foot, 125.1 pounds.
Total height, 47″.81.
Sectional area, 11″.30×11″.40=128.82 square inches.
Average thickness of joints, ″.28.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
12,882	100	0.	0.	Initial load.
19,323	150	.0018	.....	
25,764	200	.0037	.....	
32,205	250	.0054	.....	
38,646	300	.0072	.....	
45,807	350	.0092	.....	
51,528	400	.0111	.....	
57,969	450	.0132	.....	
64,410	500	.0154	.0042	
70,851	550	.0176	.....	
77,292	600	.0197	.....	
83,733	650	.0218	.....	
90,174	700	.0240	.....	
96,615	750	.0266	.....	
103,056	800	.0290	.....	
109,497	850	.0319	.....	
115,938	900	.0340	.....	
122,379	950	.0367	.....	
128,820	1,000	.0390	.0117	
135,261	1,050	.0435	.....	
141,702	1,100	.0456	.....	
148,143	1,150	.0478	.....	
154,584	1,200	.0508	.....	
161,025	1,250	.0541	.....	
167,466	1,300	.0574	.....	
173,907	1,350	.0607	.....	
180,348	1,400	.0636	.....	
186,789	1,450	.0668	.....	
193,230	1,500	.0710	.....	
199,671	1,550	.0755	.....	
206,112	1,600	.0790	.....	
212,553	1,650	.0842	.....	
218,994	1,700	.0880	.....	Cracks in sight.
225,435	1,750	.0936	.....	
231,876	1,800	.0980	.....	
238,317	1,850	.1050	.....	
244,758	1,900	.1160	.....	
251,199	1,950	.1265	.....	Ultimate strength.

No. 879.

12-inch brick pier.

Built of twenty-nine courses of common brick.
Total weight, 680 pounds.
Weight per cubic foot, 123.2 pounds.
Total height, 72″.75.
Sectional area, 11″.45×11″.45=131.10 square inches.
Average thickness of joints, ″.25.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,110	100	0.	0.	Initial load.
19,665	150	.0000	.....	
26,220	200	.0019	.....	
32,775	250	.0045	.....	
39,330	300	.0075	.....	
45,885	350	.0105	.....	
52,440	400	.0140	.....	
58,995	450	.0182	.....	
65,550	500	.0221	.0060	
72,105	550	.0270	.....	
78,660	600	.0325	.....	
85,215	650	.0388	.....	
91,770	700	.0435	.0170	
98,325	750	.0490	.....	
104,880	800	.0545	.....	
111,435	850	.0605	.....	
117,990	900	.0690	.....	
124,545	950	.0770	.....	
131,100	1,000	.0835	.0410	
137,655	1,050	.0958	.....	
144,210	1,100	.1045	.....	Cracks in sight.
150,765	1,150	.1135	.....	
157,320	1,200	.1195	.....	
163,875	1,250	.1320	.....	
170,430	1,300	.1435	.....	
176,985	1,350	.1555	.....	
183,540	1,400	.1690	.....	
190,095	1,450	.1800	.....	
196,650	1,500	.1920	.....	
203,205	1,550	.2070	.....	
209,760	1,600	.2180	.....	
216,315	1,650	.2310	.....	
222,870	1,700	.2530	.....	Ultimate strength.

No. 880.

12-*inch brick pier.*

Built of twenty-nine courses of common brick.
Total weight, 674 pounds.
Weight per cubic foot, 121.7 pounds.
Total height, 72″.75.
Sectional area, 11″.45 × 11″.48 = 131.45 square inches.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,145	100	0.	0.	Initial load.
19,718	150	.0017	.....	
26,290	200	.0042	.....	
32,863	250	.0067	.....	
39,435	300	.0100	.....	
46,008	350	.0130	.....	
52,580	400	.0175	.....	
59,153	450	.0210	.....	
65,725	500	.0250	.0085	
72,298	550	.0310	.....	
78,870	600	.0350	.....	
85,443	650	.0400	.....	
92,015	700	.0460	.0290	
98,588	750	.0540	.....	
105,160	800	.0580	.....	
111,733	850	.0665	.....	
118,305	900	.0720	.....	
124,878	950	.0785	.....	
131,450	1,000	.0880	.0440	
138,023	1,050	.0999	.....	
144,595	1,100	.1075	.....	Rested 3 minutes.
151,168	1,150	.1157	.....	
157,740	1,200	.1225	.....	
164,313	1,250	.1300	.....	
170,885	1,300	.1390	.....	
177,458	1,350	.1630	.....	Cracks in sight.
184,030	1,400	.1630	.....	
190,603	1,450	.1730	.....	
197,175	1,500	.1900	.....	
203,748	1,550	.2095	.....	
210,320	1,600	.2280	.....	
216,200	1,644	.2645	.....	Ultimate strength.

No. 881.

12-*inch brick pier.*

Built of thirty-eight courses of common brick.
Total weight, 895 pounds.
Weight per cubic foot, 121.6 pounds.
Total height, 97″.37.
Sectional area, 11″.40 × 11″.45=130.53 square inches.
Average thickness of joints, ″.27.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19,580	150	0.	0.	Initial load.
26,106	200	.0029	.....	
32,633	250	.0072	.....	
39,159	300	.0140	.....	
45,686	350	.0186	.....	
52,212	400	.0267	.....	
58,739	450	.0340	.....	
65,265	500	.0445	.0238	
71,792	550	.0540	.....	
78,318	600	.0630	.....	
84,845	650	.0750	.....	
91,371	700	.0895	.0555	
97,898	750	.1050	.....	
104,424	800	.1160	.....	
110,950	850	.1330	.....	
117,477	900	.1495	.....	
124,004	950	.1695	.....	
130,530	1,000	.1830	.1270	
137,057	1,050	.2050	.....	Cracks in upper half of pier.
143,583	1,100	.2240	.....	
150,110	1,150	.2420	.....	
156,636	1,200	.2620	.....	
163,163	1,250	.2820	.....	
169,690	1,300	.3110	.....	
176,216	1,350	.3400	.....	
182,742	1,400	.3700	.....	
185,400	1,420	.3860	.....	
190,700	1,461	.....	.....	Ultimate strength.

Opened longitudinal seams.

No. 893.

16-*inch brick pier.*

Built of forty-seven courses of common brick.
Total weight, 2,035 pounds.
Weight per cubic foot, 123.7 pounds.
Total height, 119″.
Sectional area, 15″.40×15″.50=238.70 square inches.
Average thickness of joints, ″.26.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
23,870	100	0.	0.	Initial load.
35,805	150	.0039	.....	
47,740	200	.0083	.....	
59,675	250	.0183	.....	
71,610	300	.0328	.....	
83,545	350	.0527	.....	
95,480	400	.0764	.....	
107,415	450	.1003	.....	
119,350	500	.1280	.0907	
131,285	550	.1539	.....	
143,220	600	.1790	.....	
155,155	650	.2065	.....	Cracks started 2 inches from upper end of pier.
167 090	700	.2320	.1723	
179,025	750	.2808	.....	
190,960	800	.3060	.....	
202,895	850	.3390	.....	
214,830	900	.3990	.....	
226,765	950	.4395	.....	
230,200	964	.....	.....	Ultimate strength.

Principal injury done the upper third of the pier.

No. 894.

16-inch brick pier.

Built of forty-seven courses of common brick.
Total weight, 2,043 pounds.
Weight per cubic foot, 120.1 pounds.
Total height, 119″.98.
Sectional area, 15″.60×15″.70=244.92 square inches.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
24,492	100	0.	0.	Initial load.
36,738	150	.0039	.....	
48,984	200	.0091	.....	
61,230	250	.0222	.....	
73,476	300	.0390	.....	
85,722	350	.0575	.....	
97,968	400	.0782	.....	
110,214	450	.1017	.....	
122,460	500	.1290	.0920	
134,706	550	.1581	.....	
146,952	600	.1787	.....	
159,198	650	.2085	.....	
171,444	700	.2364	.1760	Cracks in courses 2 and 4 inches from upper end.
183,690	750	.2720	.....	
195,936	800	.3020	.....	
208,182	850	.3320	.....	
220,428	900	.3610	.....	
232,674	950	.4140	.....	
244,920	1,000	.4640	.....	
247,400	1,010	.....	.....	Ultimate strength.

The principal cracks at failure were confined to the middle part and upper third of the pier.

No. 886.

12-inch hollow brick pier.

Built of nineteen courses of common brick.
Total weight, 379 pounds.
Weight per cubic foot, 127.3 pounds.
Total length, 48″.18.

Cross-section dimensions.....11″.35×11″.35=128.82 square inches.
Core ..... 4″.70× 4″.70= 22.09 Do.

Sectional area ..... 106.73 Do.

Average thickness of joints, ″.26.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,673	100	0.	0.	Initial load.
16,010	150	.0015	.....	
21,346	200	.0040	.....	
26,683	250	.0060	.....	
32,019	300	.0090	.....	
37,356	350	.0125	.....	
42,692	400	.0160	.....	
48,029	450	.0200	.....	
53,365	500	.0260	.0130	
58,702	550	.0309	.....	
64,038	600	.0360	.....	
69,375	650	.0415	.....	
74,711	700	.0480	.0280	
80,048	750	.0565	.....	
85,384	800	.0620	.....	
90,721	850	.0695	.....	
96,057	900	.0785	.....	
101,394	950	.0855	.....	
106,730	1,000	.0950	.0640	Cracks in sight.
112,067	1,050	.1100	.....	
117,403	1,100	.1165	.....	
122,740	1,150	.1240	.....	
128,076	1,200	.1365	.....	
133,413	1,250	.1445	.....	
138,749	1,300	.1530	.....	
144,086	1,350	.1645	.....	
149,422	1,400	.1750	.....	
154,759	1,450	.1860	.....	
160,095	1,500	.2000	.....	
165,432	1,550	.2110	.....	
170,768	1,600	.2250	.....	
176,105	1,650	.2410	.....	
181,441	1,700	.2530	.....	
186,778	1,750	.2640	.....	
192,114	1,800	.2790	.....	
197,451	1,850	.3000	.....	
198,100	1,856	.....	.....	Ultimate strength.

No. 898.

16-*inch, hollow, brick pier.*

Built of forty-seven courses of common brick.
Total weight, 1,443 pounds.
Weight per cubic foot, 128.9 pounds.
Total height, 118″.56.
Cross-section dimensions ..... 15″.40 × 15″.45 = 237.93 square inches.
Core ..... 8″.60 × 8″.60 = 74.82 Do.

Sectional area ..... 163.11 Do.
Average thickness of joints, ″.27.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
24,467	150	0.	0.	Initial load.
32,622	200	.0031	.....	
40,777	250	.0080	.....	
48,933	300	.0129	.....	
57,088	350	.0299	.....	
65,244	400	.0519	.....	
73,399	450	.0763	.....	
81,555	500	.1035	.0738	
89,710	550	.1340	.....	
97,866	600	.1590	.....	
106,021	650	.1910	.....	
114,177	700	.2230	.....	
122,332	750	.2568	.....	
130,488	800	.2890	.....	Cracks opened one quarter length of pier from the bottom.
138,643	850	.3230	.....	
146,799	900	.3560	.....	
154,954	950	.3892	.....	(Rested 10 minutes.)
163,110	1,000	.4300	.....	
171,266	1,050	.4780	.....	
179,421	1,100	.5065	.....	
187,576	1,150	.5490	.....	
195,732	1,200	.5845	.....	Ultimate strength.
202,000	1,238	.....	.....	

Principal lines of failure were confined to the lower half of the pier.

No. 899.

12-inch brick pier.

Built of fifty-six courses of common brick and two bond stones of North River blue-stone 3 inches thick, placed 4 feet apart in the pier.

Total weight, 1,434 pounds.

Weight per cubic foot, 122.3 pounds.

Total height, 150″.5.

Sectional area, 11″.60 × 11″.60 = 134.56 square inches.

Average thickness of joints, ″.28.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
20,284	150	0.	0.	Initial load.
26,952	200	.0025	.....	
40,368	300	.0087	.....	
53,824	400	.0189	.....	
67,260	500	.0329	.0114	
80,736	600	.0508	.....	
94,192	700	.0712	.....	
107,648	800	.0930	.....	
121,104	900	.1200	.....	
134,560	1,000	.1495	.0860	
148,016	1,100	.1858	.....	
161,472	1,200	.2181	.....	
174,928	1,300	.2530	.....	
188,384	1,400	.2980	.....	Fine cracks appear generally distributed along height of the pier.
201,840	1,500	.3390	.....	
215,296	1,600	.3840	.....	One bond stone cracks.
217,200	1,622	.....	.....	Ultimate strength.

No. 900.

12-inch brick pier.

Built of fifty-six courses of common brick and two bond stones of North River blue-stone 3 inches thick, placed 4 feet apart in the pier.

Total weight, 1,434 pounds.
Weight per cubic foot, 125 pounds.
Total height, 150″.5.
Sectional area, 11″.40 × 11″.55 = 131.67 square inches.
Average thickness of joints, ″.27.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19,751	150	0.	0.	Initial load.
26,334	200	.0025	.....	
39,501	300	.0101	.....	
52,668	400	.0235	.....	
65,835	500	.0494	.0230	
79,002	600	.0685	.....	
92,169	700	.0978	.....	
105,336	800	.1290	.....	
118,503	900	.1575	.....	Cracks in second, third, and fifth courses from top end.
131,670	1,000	.1925	.1288	
144,837	1,100	.2270	.....	
158,004	1,200	.2640	.....	
171,171	1,300	.3040	.....	Cracks opened at bottom end.
184,338	1,400	.3470	.2480	
185,000	1,405	.....	.....	Crack in one bond stone.
193,300	1,468	.....	.....	Ultimate strength.

No. 901.

8-inch grouted brick pier.

Built of twenty-one courses of common brick in neat cement grout.
Total weight, 203 pounds.
Weight per cubic foot, 117.1 pounds.
Total height, 48″.
Sectional area, 7″.9 × 7″.9 = 62.41 square inches.
Cracks opened at 40,000 pounds compression.
Ultimate strength, 72,300 pounds = 1,158 pounds per square inch.

No. 902.

8-inch grouted brick pier.

Built of twenty-one courses of face brick in neat cement grout.
Total weight, 217 pounds.
Weight per cubic foot, 124 pounds.
Total height, 47¼″.
Sectional area, 8″.00 × 8″.00 = 64.00 square inches.
Ultimate strength, 105,800 pounds = 1,654 pounds per square inch.

No. 903.

12-inch, hollow, brick pier.

Built of thirty-three courses of face brick laid without mortar.
Total weight, 610 pounds.
Weight per cubic foot, 124.5 pounds.
Total height, 73″.1.

Cross-section dimensions	11″.55 × 11″.55 =	133.40	square inches.
Core	4″.2 × 4″.2 =	17.64	Do.
Sectional area		115.76	Do.

Ultimate strength, 60,800 pounds = 525 pounds per square inch.

Cracks were opened, under a load of 5,000 pounds, through the middle of the bricks, opposite the end joints of the adjacent courses, in a manner similar to the fractures of piers laid in mortar.

The cracks rapidly increased with the loads, while the contact surfaces between the bricks increased.

Under the maximum load there were numerous fractures throughout the pier, and partial crushing and flaking of the individual bricks.

TABULATION OF THE CRUSHING STRENGTH OF FACE BRICK PIERS.

No. of test.	Nominal dimensions.			Composition of mortar.	Weight per cubic foot.	Actual dimensions.				Sectional area.	Ultimate strength.			
	Height.	Cross-section.				Height.		Cross-section.			Total.	Per sq. inch.	Per sq. foot.	Single brick.
	Feet.	*Inches.*	*Inches.*		*Pounds.*	*Feet.*	*In.*	*Inches.*	*Inches.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Tons.*	*Per cent.*
851	2	8	8	Cement 1, sand 2	132.7	2	0.	7.63	7.61	58.06	141,000	2,428	174.81	18.1
852	2	8	8	do	134.4	2	0.27	7.64	7.63	58.29	123,400	2,117	152.42	15.8
853	4	8	8	do	130.2	3	11.95	7.75	7.68	59.52	122,016	2,050	147.60	15.3
854	4	8	8	do	129.7	4	0	7.75	7.70	59.68	116,000	1,944	139.97	14.5
855	6	8	8	do	127.6	6	0.37	7.75	7.75	60.06	117,117	1,950	140.4	14.6
856	6	8	8	do	129.6	6	0.26	7.85	7.75	60.81	106,470	1,750	126.0	13.1
857	8	8	8	do	125.2	8	0.56	7.78	7.75	60.30	102,000	1,691	121.75	12.6
858	10	8	8	do	.....	9	11.27	7.80	7.70	60.06	100,749	1,677	120.77	12.5
859	10	8	8	do	126.8	10	0.37	7.82	7.80	61.00	110,500	1,811	130.39	13.5
*860	6	12	12	do	126.4	5	11.68	11.60	11.60	134.56	257,300	1,912	137.66	14.3
861	6	12	12	do	129.0	5	11.27	11.55	11.50	132.82	258,100	1,943	139.89	14.5
862	6	12 4	12 4	do	130.3	5	11	11.55 4.20	11.50 4.10	115.61	219,659	1,900	136.8	14.2
863	6	16	16	do	129.5	5	10.09	15.45	15.40	237.93	499,653	2,100	151.2	15.7
*864	6	16	16	do	126.0	5	11.81	15.45	15.35	237.16	468,700	1,976	142.27	14.7

* Core built of common brick.

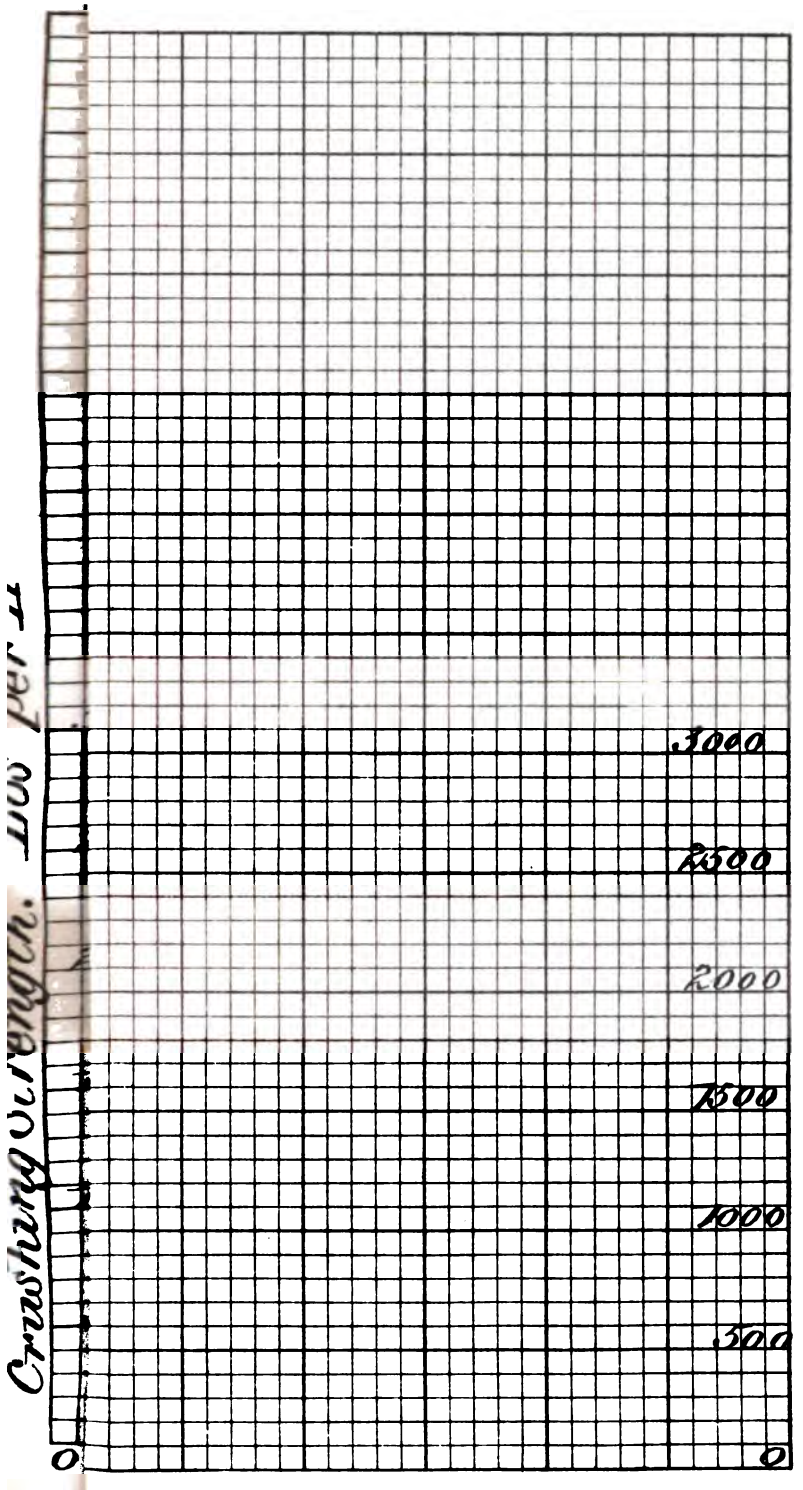
TABULATION OF THE CRUSHING STRENGTH OF COMMON BRICK PIERS.

865	2	8	8	Cement 1, sand 2	120.8	1	10.87	7.65	7.52	57.53	161,000	2,798	201.45	17.6
866	2	8	8	do	123.3	1	11.13	7.65	7.60	58.14	157,800	2,714	195.40	17.1
867	4	8	8	do	125.4	4	0.37	7.60	7.55	57.38	111,891	1,950	140.40	12.3
868	4	8	8	do	124.6	3	11.62	7.68	7.58	58.21	101,867	1,750	126.00	11.0
869	6	8	8	do	121.5	6	1.62	7.65	7.60	58.14	144,300	2,481	178.63	15.6
870	6	8	8	do	123.3	6	1.18	7.60	7.58	57.61	132,503	2,300	165.60	14.5
871	8	8	8	do	121.4	8	1.50	7.65	7.63	58.37	90,474	1,550	111.60	9.7
872	8	8	8	do	121.4	7	11.98	7.60	7.55	57.38	90,800	1,582	113.90	10.0
873	10	8	8	do	121.0	10	0.93	7.60	7.55	57.38	86,070	1,500	108.00	9.4
874	10	8	8	do	123.1	10	1.31	7.60	7.55	57.38	104,200	1,815	130.68	11.4
875	2	12	12	do	123.5	1	11.06	11.60	11.40	132.24	307,800	2,327	167.54	14.7
876	2	12	12	do	125.8	1	10.75	11.38	11.35	129.16	318,500	2,466	177.55	15.5
877	4	12	12	do	124.9	3	11.58	11.55	11.50	132.83	224,100	1,687	121.46	10.8
878	4	12	12	do	125.1	3	11.81	11.40	11.30	128.82	251,199	1,950	140.40	12.3
879	6	12	12	do	123.2	6	0.75	11.45	11.45	131.10	222,870	1,700	122.40	10.7
880	6	12	12	do	121.7	6	0.75	11.48	11.45	131.45	216,200	1,644	118.36	10.3
881	8	12	12	do	121.6	8	1.37	11.45	11.40	130.53	190,700	1,461	105.19	9.2
882	8	12	12	do	120.8	8	0.75	11.50	11.40	131.10	211,100	1,610	115.92	10.1

TABULATION OF THE CRUSHING STRENGTH OF COMMON BRICK PIERS—Continued.

No. of test.	Nominal dimensions.			Composition of mortar.	Weight per cubic foot.	Actual dimensions.				Sectional area.	Ultimate strength.			
	Height.	Cross-section.				Height.		Cross-section.			Total.	Per sq. inch.	Per sq. foot.	Single brick.
	Feet.	*Inches.*	*Inches.*		*Pounds.*	*Feet.*	*In.*	*Inches.*	*Inches.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Tons.*	*Per cent.*
883	10	12	12	Cement 1, sand 2	119.5	10	1.00	11.55	11.45	132.25	178,200	1,347	96.98	8.5
884	2	12 4	12 4	do	126.2	1	11.00	11.40 4.55	11.40 4.50	109.48	271,500	2,480	178.56	15.7
885	2	12 4	12 4	do	127.7	2	1.12	11.45 4.90	11.40 4.55	108.23	265,400	2,452	176.54	15.5
886	4	12 4	12 4	do	127.3	4	0.18	11.35 4.70	11.35 4.70	106.73	198,100	1,856	133.63	11.7
887	4	12 4	12 4	do	127.7	3	11.08	11.45 4.80	11.40 4.70	107.97	215,200	1,993	143.49	12.5
888	6	12 4	12 4	do	118.8	6	0.75	11.35 4.90	11.35 4.60	106.28	162,100	1,525	110.52	9.6
889	8	12 4	12 4	do	124.3	8	3.18	11.50 4.90	11.50 4.80	108.73	184,841	1,700	122.40	10.7
890	10	12 4	12 4	do	125.1	10	2.27	11.50 4.80	11.40 4.80	108.06	157,500	1,457	104.90	9.2
891	6	16	16	do	123.0	6	1.18	15.50	15.45	239.48	358,200	1,495	107.64	9.4
892	6	16	16	do	121.8	6	1.37	15.70	15.65	245.71	356,600	1,451	104.49	9.1
893	10	16	16	do	123.7	9	11.00	15.50	15.40	238.70	230,200	964	69.41	6.1
894	10	16	16	do	120.1	9	11.98	15.70	15.60	244.92	247,400	1,010	72.72	6.3
895	6	16 8	16 8	do	124.3	6	0.68	15.45 8.60	15.45 8.30	167.32	270,100	1,614	116.21	10.2
896	6	16 8	16 8	do	125.6	6	0.68	15.50 8.70	15.45 8.60	164.66	260,200	1,580	113.76	9.9
897	10	16 8	16 8	do	123.4	9	11.25	15.40 8.40	15.40 8.30	167.44	212,100	1,267	91.22	8.0
898	10	16 8	16 8	do	128.9	9	10.56	15.45 8.70	15.40 8.60	163.11	202,000	1,238	89.14	7.8
*899	12½	12	12	do	122.3	12	6.5	11.60	11.60	134.56	217,200	1,622	116.78	10.2
*900	12½	12	12	do	125.0	12	6.5	11.55	11.40	131.67	193,300	1,468	105.69	9.2
‡901	4	8	8	Neat cement grout	117.1	4	0.	7.90	7.90	62.41	72,300	1,158	83.37	7.3
‡902	4	8	8	do	124.0	3	11.25	8.00	8.00	64.00	105,800	1,654	119.00	12.3
§903	6	12 4	12 4	Without mortar	124.5	6	1.1	11.55 4.20	11.55 4.20	115.76	60,800	525	37.80	3.9

* Laid with bond stones 4 feet apart.
‡ Common brick pier grouted.
Face brick pier grouted.
§ Face brick pier, laid without mortar.



H Ex 31 49 2

TENSILE TESTS OF O. H. STEEL BOILER-PLATES.

[NOTE.—Lengthwise specimens marked L; crosswise specimens marked C.]

No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.			Dimensions.	Area.												
		Inches.	*Inch.*	*Sq.in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inch.*	*P. ct.*	*Inches.*	*Sq.in.*	*P. ct.*		"	"	"	"	"	"	"	"	"	"
1064	L	1.500	.378	.567	19,550	34,480	31,780	56,050	3.19	31.0	1.06×.24	.254	55.2	Silky	.27	.30	.25	.25	.24	.31	*.74	.32	.26	.25
1065	C	1.497	.405	.606	24,600	40,500	37,400	61,720	1.97	19.7	1.10×.28	.308	49.1	Silky, slight lamination	.28	.23	.19	.19	.19	.18	.17	.18	.18	.18
1066	L	1.497	.367	.549	19,480	35,480	31,300	57,010	2.52	25.2	1.06×.22	.233	57.5	Silky	*.69	.28	.23	.27	.25	.25	.17	.16	.12	.10
1067	C	1.498	.391	.589	21,600	36,860	35,080	59,860	2.21	22.1	1.10×.25	.275	53.0	Silky, slight lamination	.26	*.64	.21	.19	.16	.17	.17	.15	.14	.12
1068	L	1.500	.377	.566	22,100	39,050	34,250	60,510	2.76	27.6	1.06×.23	.244	56.8	Silky	.26	*.65	.26	.21	.23	.24	.23	.22	.21	.25
1069	C	1.499	.400	.600	19,900	33,170	35,450	59,080	2.59	25.9	1.06×.26	.276	54.0	Silky, slight lamination	.25	*.67	.32	.21	.22	.19	.17	.19	.19	.18
1070	L	1.493	.380	.567	20,080	35,410	33,370	58,850	2.36	23.6	1.09×.25	.273	51.8	Silky, very lamellar	.22	.26	*.63	.28	.20	.16	.15	.14	.17	.15
1071	C	1.500	.402	.603	20,700	36,900	35,500	58,870	2.37	23.7	1.12×.27	.302	49.9	Silky, lamellar	*.41	.50	.22	.24	.17	.17	.16	.16	.17	.17
1072	L	1.496	.375	.561	20,800	37,080	31,600	56,330	2.57	25.7	1.13×.22	.240	55.6	do	.32	*.61	.25	.20	.16	.18	.17	.21	.23	.24
1073	C	1.496	.400	.598	21,250	35,540	34,050	56,940	2.93	29.3	1.12×.27	.302	49.4	do	.27	.28	.35	.55	.43	.24	.24	.22	.19	.16
1074	L	1.500	.293	.440	16,100	36,590	24,510	55,700	2.43	24.3	1.10×.18	.198	55.0	Silky, very lamellar	.17	.15	.19	.21	.31	*.66	.23	.18	.17	.16
1075	C	1.500	.343	.515	21,600	41,940	29,900	58,060	2.28	22.8	1.23×.26	.320	37.8	do	.21	*.49	.22	.20	.20	.19	.17	.19	.21	.20
1076	L	1.502	.308	.463	19,580	42,290	28,420	61,380	1.89	18.9	1.10×.20	.220	52.4	Silky	.22	.19	.18	.15	.17	.18	.19	.21	.19	.21
1077	C	1.500	.347	.521	21,300	40,880	32,250	61,900	2.59	25.9	1.14×.24	.274	47.4	do	.21	.20	.24	*.56	.37	.21	.19	.18	.20	.23
1078	L	1.500	.307	.461	18,400	39,910	26,240	56,920	2.31	23.1	1.07×.18	.193	58.1	do	.38	.24	.21	.24	.22	.22	.21	.20	.20	.19
1079	C	1.500	.350	.525	20,250	38,570	31,520	60,040	1.79	17.9	1.12×.23	.258	50.8	Silky, lamellar	.21	.18	.14	.16	.20	.19	.20	.16	.17	.18
1080	L	1.500	.314	.471	18,400	39,070	27,940	59,320	2.74	27.4	1.06×.20	.212	54.9	do	*.67	.25	.25	.25	.25	.22	.18	.19	.23	.25
1081	C	1.500	.342	.513	20,600	40,250	31,200	60,820	2.32	23.2	1.10×.22	.242	52.8	Silky	*.64	.36	.21	.17	.20	.16	.18	.15	.13	.12
1082	L	1.500	.308	.462	18,600	40,260	28,020	60,650	2.81	28.1	1.09×.19	.207	55.1	Fine silky	.20	.23	.29	*.66	.28	.26	.27	.23	.20	.19
1083	C	1.505	.314	.473	18,300	38,690	28,700	60,680	2.33	23.3	1.11×.20	.222	53.0	Silky	.20	.27	*.61	.24	.18	.18	.14	.17	.18	.16
1084	L	1.500	.307	.461	18,280	39,650	*27,270	59,150	2.64	20.4	1.08×.19	.205	55.5	Silky, slight lamination	*.57	.40	.22	.19	.18	.19	.21	.22	.23	.23
1085	C	1.505	.343	.516	21,500	41,670	29,400	56,980	1.46	14.6	1.12×.23	.258	50.0	Silky, lamellar	.19	.15	.14	.13	.13	.14	.15	.15	.13	.15
1086	L	1.500	.306	.459	16,980	36,990	26,100	56,860	2.59	25.9	1.10×.19	.209	54.4	Fine silky	.25	*.43	*.53	.24	.20	.19	.18	.19	.19	.17
1087	C	1.500	.312	.468	19,200	41,030	27,980	59,790	2.57	25.7	1.10×.19	.209	55.3	Silky, slight lamination	.23	*.61	.30	.24	.19	.21	.23	.21	.19	.16
1088	L	1.505	.305	.459	17,800	38,780	25,100	54,680	2.76	27.6	1.10×.17	.187	59.2	Silky	.23	.23	.25	*.69	.28	.23	.22	.21	.21	.21
1089	C	1.505	.348	.524	21,000	40,080	31,750	60,590	2.51	25.1	1.10×.24	.264	49.6	do	.31	*.64	.29	.26	.23	.18	.15	.16	.15	.14
1090	L	1.506	.304	.458	19,100	41,700	29,840	65,150	2.81	28.1	1.09×.19	.207	54.8	do	.26	.26	*.48	.49	.28	.26	.20	.20	.19	.19
1091	C	1.505	.310	.467	18,380	39,360	28,460	60,940	2.37	23.7	1.12×.20	.224	52.0	Silky, slight lamination	*.53	.18	.21	.18	.19	.21	.22	.23	.21	.21
1092	L	1.500	.304	.456	17,480	38,340	26,880	58,950	2.68	26.8	1.18×.19	.224	50.8	Silky	.26	.25	.25	.25	*.61	.27	.22	.21	.19	.17
1093	C	1.506	.336	.506	18,600	36,760	27,860	55,060	2.73	27.3	1.14×.22	.251	50.3	Silky, lamellar	.22	.20	.34	.32	*.61	.28	.24	.19	.17	.16
1094	L	1.503	.306	.460	17,200	37,390	26,350	57,280	1.63	16.3	1.16×.18	.209	54.5	do	.19	.15	.16	.15	.16	.17	.16	.17	.16	.16
1095	C	1.501	.354	.531	20,100	37,850	31,900	60,080	2.17	21.7	1.14×.25	.285	46.3	Silky, very lamellar	.26	*.58	.26	.19	.15	.15	.14	.14	.14	.16
1096	L	1.501	.301	.452	17,700	39,160	26,650	58,900	2.21	22.1	1.18×.18	.212	53.1	Silky	.18	.33	*.52	.24	.22	.17	.14	.15	.13	.13
1097	C	1.501	.333	.500	18,800	37,600	29,680	58,160	1.77	17.7	1.10×.21	.231	53.8	do	.24	.20	.19	.20	.18	.16	.16	.15	.15	.14
1098	L	1.503	.312	.469	20,750	44,240	29,600	63,110	2.38	23.8	1.15×.20	.230	50.9	Silky, slightly lamellar	.25	*.62	.20	.13	.15	.17	.21	.23	.22	.20
1099	C	1.500	.350	.525	23,200	44,190	33,700	64,190	1.93	19.3	1.15×.24	.276	47.7	Silky	*.52	.21	.16	.12	.11	.14	.13	.17	.22	.15
1100	L	1.504	.374	.562	18,180	32,350	29,750	52,940	2.02	20.2	1.06×.23	.244	56.5	Silky, very lamellar	.33	.22	.25	.25	.23	.18	.16	.19	.21	.22

* Indicates fractured section.

TENSILE TESTS OF O. H. STEEL BOILER-PLATES.—Continued.

No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.			Dimensions.	Area.												
		Inches.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inch.*	*P. ct.*	*Inches.*	*Sq. in.*	*P. ct.*		"	"	"	"	"	"	"	"	"	"
1101	C	1.505	.388	.584	18,780	32,160	31,710	54,300	2.24	22.4	1.09×.24	.262	55.1	Silky, very lameller	.26	.23	.24	*.44	.63	.30	.26	.19	.17	.20
1740	L	1.496	.380	.568	22,380	39,400	35,320	62,180	2.79	27.9	1.07×.24	.257	54.7	Silky	.18	.20	.33	*.65	.26	.26	.29	.24	.20	.18
1741	C	1.493	.368	.550	21,500	39,090	33,900	61,640	1.94	19.4	1.09×.25	.273	50.3	.....do	.23	.22	.20	.21	.18	.17	.18	.18	.19	.18
1742	L	1.500	.370	.555	21,350	38,470	33,200	59,820	1.91	19.1	1.08×.23	.248	55.3	.....do	.28	.19	.16	.18	.18	.17	.20	.20	.17	.18
1743	C	1.498	.377	.565	19,460	34,440	32,080	56,780	2.75	27.5	1.10×.25	.275	52.3	.....do	.38	*.63	.26	.22	.25	.25	.22	.18	.19	.17
1744	L	1.500	.366	.549	22,300	40,620	34,500	62,810	2.68	26.8	1.10×.24	.264	51.9	Silky, slight lamination	*.64	.25	.18	.16	.19	.19	.24	.27	.30	.26
1745	C	1.505	.366	.551	22,590	41,000	33,720	61,200	2.78	27.8	1.15×.27	.316	42.6	Silky, lamellar	.21	.26	*.51	.37	.26	.27	.24	.24	.22	.20
1746	L	1.504	.354	.532	22,700	42,670	31,850	59,870	2.79	27.9	1.08×.22	.238	55.2	Silky	.27	.28	.35	*.69	.25	.23	.20	.17	.17	.18
1747	C	1.504	.366	.550	22,960	41,780	34,800	63,270	2.28	22.8	1.16×.23	.267	51.4	Silky, trace of lamination	.27	*.62	.24	.19	.19	.17	.15	.16	.14	.15
1748	L	1.503	.365	.549	21,460	39,090	33,450	60,930	2.37	23.7	1.10×.24	.264	51.9	Silky, slight lamination	*.48	*.51	.23	.18	.16	.15	.16	.15	.17	.18
1749	C	1.503	.388	.583	25,900	44,430	36,000	61,900	2.23	22.3	1.13×.27	.305	47.6	Silky, lamellar	.28	.20	.23	.21	.20	.22	.20	.22	.22	.25
1750	L	1.503	.292	.438	18,720	42,740	26,750	61,070	2.50	25.0	1.21×.17	.206	53.0	Silky	.24	*.60	.28	.22	.22	.22	.25	.19	.18	.16
1751	C	1.506	.329	.495	20,080	40,570	29,760	60,120	2.48	24.8	1.13×.23	.260	47.5	Silky, trace of lamination	.16	.25	*.58	.19	.21	.19	.24	.20	.21	.25
1752	L	1.504	.298	.448	18,980	42,370	29,370	65,560	2.37	23.7	1.16×.19	.220	50.7	Silky	*.58	.22	.18	.16	.17	.20	.22	.24	.19	.21
1753	C	1.502	.328	.493	21,100	42,800	31,380	63,650	1.49	14.9	1.15×.23	.265	46.3	.....do	.19	.20	.18	.16	.14	.13	.13	.13	.11	.12
1754	L	1.512	.299	.452	18,420	40,750	29,800	65,930	1.74	17.4	1.20×.20	.240	46.9	Silky, trace of lamination	*.38	*.39	.17	.13	.12	.11	.11	.11	.10	.12
1755	C	1.510	.333	.503	22,040	43,820	31,980	63,580	1.88	18.8	1.21×.23	.278	44.6	Silky, slight lamination	.26	*.50	.17	.16	.15	.14	.14	.15	.12	.09
1756	L	1.511	.301	.455	18,850	41,430	27,460	60,350	1.42	14.2	1.19×.19	.226	50.2	Fine silky	.15	.15	.17	.14	.12	.12	.13	.14	.16	.14
1757	C	1.508	.336	.507	21,500	42,410	31,800	62,720	2.04	20.4	1.18×.24	.283	44.1	Silky	*.57	.22	.18	.17	.15	.10	.15	.15	.14	.12
1758	L	1.512	.292	.442	17,940	40,590	25,880	58,550	1.24	12.4	1.18×.17	.201	54.6	.....do	.20	.17	.13	.12	.10	.10	.10	.11	.10	.11
1759	C	1.504	.326	.490	21,400	43,670	29,700	60,610	2.40	24.0	1.16×.23	.267	45.5	Silky, trace of lamination	.22	*.56	.25	.24	.24	.20	.17	.16	.19	.17
1760	L	1.502	.290	.436	18,450	42,320	26,890	61,670	1.63	16.3	1.15×.17	.196	55.1	Silky	.27	.25	.19	.15	.12	.14	.14	.13	.12	.12
1761	C	1.500	.323	.485	20,900	43,090	30,260	62,390	2.07	20.7	1.16×.24	.278	42.6	Silky, slight lamination	.30	*.53	.24	.19	.16	.16	.13	.11	.12	.13
1762	L	1.505	.281	.423	16,040	37,920	25,480	60,240	2.54	25.4	1.16×.18	.209	50.6	Silky	.19	.22	.26	.26	.31	*.58	.21	.17	.16	.15
1763	C	1.500	.286	.429	16,570	38,620	25,820	60,190	1.99	19.9	1.15×.19	.219	49.0	.....do	*.56	.22	.21	.15	.15	.17	.13	.13	.12	.15
1764	L	1.490	.288	.429	17,380	40,510	26,980	62,890	2.26	22.6	1.16×.17	.197	54.0	.....do	.17	.15	.15	.15	.12	.10	.24	*.64	.20	.19
1765	C	1.504	.291	.438	17,820	39,540	27,100	61,870	1.63	16.3	1.16×.20	.232	47.0	.....do	.19	.15	.18	.17	.18	.15	.17	.17	.15	.12
1766	L	1.494	.305	.456	19,900	43,640	28,280	62,020	2.29	22.9	1.16×.19	.220	51.6	.....do	.14	.15	.14	.18	.23	*.59	.28	.18	.19	.21
1767	C	1.492	.335	.500	21,320	42,640	31,400	62,800	2.04	20.4	1.24×.25	.310	38.0	Silky, slight lamination	*.49	.30	.18	.13	.14	.16	.17	.17	.15	.15
1768	L	1.492	.298	.445	16,750	37,640	26,200	58,880	1.33	13.3	1.29×.17	.219	50.7	Silky, surface pitted; broke at indentation.	.19	*.38	.12	.10	.11	.11	.10	.06	.09	.07
1769	C	1.494	.335	.500	21,450	42,900	31,710	63,420	2.30	23.0	1.16×.22	.255	48.0	Silky	.10	.17	.21	.25	.22	*.46	.29	.15	.19	.18
1770	L	1.505	.300	.452	20,180	44,650	30,000	66,370	1.97	19.7	1.18×.23	.271	56.2	.....do	.20	.32	*.51	.21	.10	.12	.11	.10	.09	.15
1771	C	1.502	.332	.499	20,710	41,500	30,780	61,680	1.35	13.5	1.15×.19	.219	39.0	.....do	.18	.15	.15	.12	.10	.13	.14	.12	.12	.14
1772	L	1.501	.299	.449	15,400	35,190	24,600	54,700	2.27	22.7	1.00×.15	.164	63.5	.....do	.15	.10	.23	*.69	.17	.15	.17	.17	.17	.18
1773	C	1.495	.307	.459	14,840	32,330	24,950	54,360	2.22	22.2	1.20×.20	.240	47.7	.....do	*.45	.37	.20	.18	.10	.19	.20	.16	.14	.14
1774	L	1.505	.295	.444	16,300	36,710	24,790	53,580	1.43	14.3	1.11×.16	.178	60.0	.....do	.17	.15	.17	.17	.13	.13	.11	.12	.13	.15
1775	C	1.508	.310	.467	16,380	35,070	25,840	55,330	1.68	16.8	1.12×.20	.224	52.0	.....do	.17	.15	.16	.18	.19	.18	.16	.12	.18	.19
1776	L	1.508	.363	.547	19,500	35,650	29,440	53,820	1.68	16.8	1.06×.22	.233	58.2	.....do	.29	.21	.18	.18	.14	.14	.15	.14	.13	.12
1777	C	1.509	.371	.560	16,700	29,820	30,300	54,110	2.42	24.2	1.10×.25	.275	50.8	.....do	.23	.24	.27	*.65	.23	.20	.17	.17	.15	.11
1778	L	1.496	.301	.450	16,800	37,330	25,500	56,670	1.67	16.7	1.08×.18	.194	56.8	.....do	*.45	*.46	.13	.14	.10	.09	.06	.05	.08	.11

1779	C	1.494	.318	.475	13,800	29,050	24,100	50,740	1.44	14.4	1.17×.19	.222	53.2	Silky, slight lamina ion	.18	.19	.23	.24	.16	.09	.07	.08	.08	.12
1780	L	1.499	.291	.436	15,720	36,060	24,210	55,530	1.56	15.6	1.08×.17	.184	57.7	Silky	.26	.22	.16	.15	.12	.15	.16	.11	.10	.13
1781	C	1.502	.300	.451	14,480	32,110	23,520	52,150	1.23	12.3	1.14×.19	.217	51.9	do	.17	.16	.10	.08	.10	.15	.13	.12	.11	.11
1782	L	1.507	.348	.524	20,100	38,360	32,140	61,340	2.34	23.4	1.12×.21	.239	55.6	do	.18	.20	.22	.20	.17	.24	*.62	.19	.16	.16
1783	C	1.507	.362	.546	19,500	35,710	33,180	60,770	2.27	22.7	1.15×.24	.276	49.4	do	*.20	*.40	*.37	.14	.23	.34	.13	.15	.14	.17
1784	L	1.511	.370	.559	22,400	40,070	31,980	57,210	2.27	22.7	1.13×.20	.226	59.5	Silky, slight lamination	.19	.12	.17	*.60	.29	.15	.16	.16	.19	.24
1785	C	1.505	.382	.575	18,960	32,970	32,460	56,450	2.33	23.3	1.12×.26	.291	49.3	Silky	.17	.25	*.58	.20	.22	.20	.20	.20	.16	.15
1786	L	1.511	.349	.527	18,880	35,830	27,550	52,280	2.32	23.2	1.08×.18	.194	63.1	do	.28	*.72	.19	.17	.14	.15	.15	.17	.17	.18
1787	C	1.510	.359	.542	17,820	32,880	27,780	51,250	2.70	27.0	1.08×.22	.238	56.2	do	.24	*.71	.25	.26	.24	.21	.21	.20	.20	.18
1788	L	1.516	.288	.437	16,800	38,440	26,120	59,770	2.34	23.4	1.11×.17	.189	56.8	do	.13	.18	.21	.16	*.51	.31	.18	.22	.27	.17
1789	C	1.510	.315	.476	15,650	32,880	25,080	52,690	1.82	18.2	1.21×.23	.278	41.5	Silky, seam 1 inch wide	.15	.15	*.42	.17	.16	.16	.17	.17	.15	.12
1789a	L	1.509	.288	.435	15,700	36,090	22,800	52,410	1.56	15.6	1.05×.15	.158	63.7	Silky	.24	.14	.19	.16	.16	.17	.15	.12	.12	.11
1790	C	1.500	.282	.423	14,600	34,520	22,110	52,270	2.29	22.9	1.11×.19	.211	50.1	Silky, slight lamination	.21	*.63	.31	.18	.18	.17	.14	.16	.15	.16
1791	L	1.466	.286	.419	16,250	38,780	23,620	56,370	1.93	19.3	1.08×.17	.184	56.1	Silky	*.68	.23	.18	.14	.10	.10	.10	.11	.14	.15
1792	C	1.508	.298	.449	17,300	38,530	24,860	55,370	.63	6.3	Broke at chisel mark.			do	.10	.08	.08	.07	.07	.07	.07	.06	.02	.01
1793	L	1.509	.358	.540	20,950	38,800	30,180	55,890	1.79	17.9	1.07×.21	.225	58.3	do	.15	.18	.19	.16	.18	.16	.17	.19	.22	.19
1794	C	1.509	.372	.561	16,900	30,120	30,100	53,650	1.71	17.1	Broke at chisel mark.			do	.16	.16	.16	.15	.15	.19	.23	.20	.17	.14
1795	L	1.514	.300	.454	14,650	32,270	24,100	53,080	1.82	18.2	1.17×.20	.234	48.4	Silky, laminated	.35	.23	.26	.30	.23	.17	.13	.08	.04	.03
1796	C	1.500	.296	.444	16,980	38,240	24,900	56,080	2.54	25.4	1.07×.18	.193	56.6	Silky	.22	.26	*.65	.32	.17	.16	.18	.17	.20	.21
1797	L	1.470	.260	.382	15,250	39,920	20,190	52,850	1.28	12.8	1.10×.13	.143	62.5	Silky, slight lamination	.30	.24	.17	.12	.09	.06	.06	.08	.07	.09
1798	C	1.515	.298	.451	15,240	33,790	23,680	52,510	2.53	25.3	1.16×.21	.244	45.9	do	.60	.81	.20	.16	.17	.20	.25	.22	.21	.21
1799	L	1.504	.275	.414	14,200	34,300	22,020	54,640	2.20	22.0	1.08×.16	.173	58.2	Silky	.18	.34	*.54	.14	.14	.16	.17	.17	.20	.16
1800	C	1.505	.300	.452	14,250	31,530	23,810	52,680	2.45	24.5	1.11×.20	.222	50.8	Silky, slight lamination	.18	.20	.20	.18	.20	.25	*.63	.25	.21	.15
1801	L	1.503	.307	.461	16,280	35,310	25,440	55,180	2.07	20.7	1.06×.16	.170	63.2	Silky	*.67	.21	.15	.15	.16	.14	.14	.15	.13	.17
1802	C	1.500	.328	.492	15,470	31,440	27,200	55,280	2.21	22.1	1.17×.21	.246	50.0	do	.15	.24	*.60	.22	.18	.15	.17	.17	.14	.19
1803	L	1.510	.285	.430	16,600	38,600	24,780	57,630	1.66	16.6	1.13×.16	.180	58.1	do	.21	.19	.16	.16	.14	.15	.19	.14	.14	.18
1804	C	1.491	.296	.441	15,200	34,470	25,380	57,550	2.27	22.7	1.17×.21	.246	44.2	do	.13	.16	.17	.27	*.58	.21	.20	.18	.19	.18
1805	L	1.510	.298	.450	17,940	39,890	26,060	57,910	2.22	22.2	1.12×.18	.202	55.2	do	.24	.19	.26	*.57	.15	.16	.15	.17	.18	.15
1806	C	1.510	.315	.476	15,760	33,110	26,070	54,770	2.16	21.6	1.16×.21	.244	48.8	Silky, trace of lamination	.21	*.61	.26	.18	.13	.17	.16	.14	.15	.15
1807	L	1.502	.313	.476	16,550	34,770	26,820	56,340	1.59	15.9	1.11×.17	.189	60.3	Silky	.17	.17	.17	.17	.16	.14	.17	.16	.11	.17
1808	C	1.499	.325	.487	18,650	38,300	28,320	58,150	1.37	13.7	Broke at chisel mark.			Silky, laminated	.16	.15	.13	.14	.15	.14	.14	.12	.13	.11
1809	L	1.517	.265	.402	14,470	36,000	21,070	52,410	2.72	27.2	1.10×.13	.143	64.4	Silky	.21	.20	.36	*.67	.25	.28	.20	.18	.19	.18
1810	C	1.506	.287	.432	14,050	32,520	22,480	52,040	2.57	25.7	1.09×.17	.185	57.1	Silky, traces of lamination	.28	*.69	.25	.20	.20	.19	.19	.20	.19	.18
1811	L	1.510	.282	.426	16,720	39,250	23,910	56,130	2.28	22.8	1.14×.16	.182	59.5	Silky	.15	.14	.16	.22	*.63	.21	.18	.19	.20	.20
1812	C	1.510	.288	.435	15,580	35,820	24,610	56,570	1.53	15.3	1.14×.20	.228	45.2	do	.23	.20	.19	.16	.14	.12	.14	.13	.10	.12
1813	L	1.510	.285	.430	17,300	40,230	25,100	58,370	2.38	23.8	1.12×.17	.190	53.3	do	.16	.26	*.58	.17	.18	.15	.23	.24	.22	.19
1814	C	1.514	.295	.447	14,840	33,200	24,760	55,390	1.71	17.1	1.18×.20	.236	47.2	do	.18	.14	.19	.21	.19	.19	.16	.14	.14	.17
1815	L	1.515	.280	.424	17,520	41,320	23,640	55,750	3.04	30.4	1.09×.14	.153	64.0	do	*.73	.27	.29	.34	.25	.31	.23	.20	.23	.19
1816	C	1.514	.288	.436	15,220	34,910	21,800	50,000	1.13	11.3	Broke at chisel mark.			do	.15	.14	.13	.11	.11	.08	.10	.08	.12	.11
1817	L	1.508	.299	.451	16,600	36,810	25,810	57,230	2.29	22.9	1.12×.17	.190	57.7	do	.16	.16	.24	*.66	.20	.17	.18	.17	.18	.17
1818	C	1.510	.318	.480	17,050	34,580	26,100	54,375	1.08	10.8	Broke at chisel mark.			Silky, lamellar	.11	.11	.10	.12	.10	.12	.11	.10	.11	.10
1819	L	1.517	.300	.455	18,450	40,550	26,720	58,730	2.33	23.3	1.09×.18	.196	56.8	Silky	.17	.20	.22	.26	*.65	.26	.16	.14	.12	.15
1820	C	1.506	.300	.452	18,900	41,810	26,700	59,070	1.16	11.6	Broke at chisel mark.			do	.14	.18	.07	.12	.20	.22	.23	.20	.17	.17
1821	L	1.510	.296	.447	18,300	41,390	26,500	59,280	1.32	13.2	1.14×.16	.182	59.1	do	.19	.10	.04	.06	.11	.15	.17	.15	.19	.16
1822	C	1.507	.298	.449	18,100	40,310	26,700	59,470	1.44	14.4	Broke at chisel mark.			do	.13	.16	.17	.17	.16	.15	.16	.10	.11	.13
1823	L	1.486	.300	.446	17,190	38,340	26,290	58,950	2.64	26.4	1.08×.18	.194	56.4	Silky, slight lamination	*.64	.35	.25	.24	.22	.20	.20	.19	.17	.18
1824	C	1.512	.320	.484	19,200	39,670	27,190	56,180	1.58	15.8	1.19×.21	.250	48.3	do	.20	.17	.18	.17	.15	.15	.14	.13	.14	.15
1825	L	1.514	.293	.444	18,180	40,950	26,450	59,570	2.34	23.4	1.12×.19	.213	52.0	Silky	.19	.17	.17	.20	.26	*.65	.22	.16	.16	.16
1826	C	1.471	.313	.460	18,350	39,890	28,010	60,890	1.72	17.2	1.13×.20	.226	50.8	do	.27	.21	.19	.15	.16	.14	.15	.16	.15	
1827	L	1.514	.315	.477	19,050	39,940	28,840	60,550	2.28	22.8	1.16×.19	.220	53.7	Silky, slight lamination	*.38	.26	.19	.20	.21	.19	.20	.16	.14	.15
1828	C	1.521	.329	.500	18,100	36,200	28,060	56,120	1.57	15.7	1.14×.21	.239	52.1	Silky	.32	.20	.15	.15	.15	.14	.14	.13	.13	.15

* Indicates fractured section.

TENSILE TESTS OF O. H. STEEL BOILER-PLATES—Continued.

No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.			Dimensions.	Area.												
		Inches.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*P. ct.*	*Inches.*	*Sq. in.*	*P. ct.*		"	"	"	"	"	"	"	"	"	"
1829	L	1.520	.314	.477	19,450	40,700	29,820	62,520	2.03	20.3	1.15×.20	.230	51.7	Silky	*.55	.19	.17	.17	.14	.15	.13	.17	.19	.17
1830	C	1.518	.330	.501	20,500	40,920	29,700	59,280	1.22	12.2	1.16×.21	.244	51.1	do	.19	.17	.13	.12	.11	.09	.09	.10	.10	.12
1831	L	1.519	.295	.448	19,780	44,150	28,280	63,125	2.96	29.6	1.12×.18	.202	55.0	Silky, slight lamination	.24	.28	*.67	.28	.24	.23	.22	.23	.31	.26
1832	C	1.519	.335	.509	20,300	39,880	31,560	62,000	1.65	16.5	1.19×.23	.274	46.2	Silky	.20	.21	.18	.13	.15	.13	.16	.18	.15	.16
1833	L	1.512	.310	.469	17,800	37,950	27,600	58,850	2.79	27.9	1.11×.19	.211	55.0	do	.28	*.66	.30	.24	.22	.20	.20	.21	.23	.25
1834	C	1.458	.356	.519	21,100	40,660	30,510	58,790	1.79	17.9	1.06×.23	.244	53.0	do	.25	.21	.20	.18	.15	.16	.17	.16	.15	.16
1835	L	1.510	.302	.456	17,200	37,720	26,710	58,570	2.12	21.2	1.12×.19	.213	53.3	do	.38	.23	.20	.21	.20	.17	.18	.19	.19	.17
1836	C	1.511	.325	.491	20,040	40,810	29,280	59,630	1.45	14.5	1.13×.21	.237	51.6	do	.22	.18	.16	.14	.14	.14	.12	.11	.11	.13
1837	L	1.523	.325	.495	18,200	36,770	29,120	58,830	2.41	24.1	1.12×.19	.213	57.0	do	.29	*.66	.25	.20	.17	.15	.16	.16	.18	.19
1838	C	1.519	.331	.503	18,700	37,180	28,140	55,940	2.22	22.2	1.10×.21	.231	54.0	do	.43	.27	.21	.20	.21	.20	.18	.19	.18	.15
1839	L	1.521	.303	.461	18,380	39,870	27,260	59,130	2.83	28.3	1.12×.19	.213	53.8	do	.24	.20	.19	.23	.23	.39	*.62	.28	.23	.22
1840	C	1.522	.328	.499	19,960	40,000	30,080	60,280	1.55	15.5	1.18×.23	.271	45.6	do	.24	.18	.16	.15	.16	.13	.15	.13	.12	.13
1841	L	1.519	.313	.475	15,120	31,830	24,960	52,550	3.19	31.9	1.10×.17	.187	60.6	do	.22	.24	.23	.27	*.73	.33	.26	.26	.32	.33
1842	C	1.521	.311	.473	14,800	31,290	25,880	54,710	2.37	23.7	1.15×.19	.219	53.8	do	.23	.25	.23	.20	.21	.21	.25	.26	.28	.25
1843	L	1.502	.312	.469	17,750	37,850	27,150	57,890	2.36	23.6	1.17×.18	.211	55.1	do	.26	*.60	.30	.21	.19	.17	.19	.16	.14	.14
1844	C	1.510	.315	.476	17,520	36,810	27,820	58,450	2.58	25.8	1.24×.23	.285	40.1	Silky, slight lamination	.27	.24	.19	.22	*.62	.25	.20	.18	.19	.22
1845	L	1.520	.311	.473	18,020	38,100	27,480	58,100	2.33	23.3	1.15×.21	.242	48.9	do	.18	.21	.21	.20	.24	*.60	.22	.16	.17	.14
1846	C	1.521	.342	.520	18,760	36,080	30,280	58,230	1.21	12.1	1.16×.22	.285	50.1	do	.14	.13	.12	.11	.12	.12	.14	.12	.11	.11
1847	L	1.520	.309	.470	15,750	33,510	26,190	55,720	3.02	30.2	1.14×.17	.198	57.8	Silky	.20	.23	.26	.27	.30	.32	*.70	.30	.25	.19
1848	C	1.518	.312	.474	17,320	36,540	27,140	57,260	2.23	22.3	1.21×.22	.266	43.8	Silky, laminated, seam ¼ inch long.	.30	.18	.15	.18	.19	.18	.20	.29	.32	.24
1849	L	1.504	.301	.453	17,680	39,030	27,090	59,800	2.71	27.1	1.10×.20	.220	51.4	Silky, slight lamination	.22	.24	.23	.23	*.60	.37	.25	.21	.18	.18
1850	C	1.504	.331	.498	18,700	37,550	30,060	60,360	1.59	15.9	1.24×.22	.273	45.2	do	.24	.18	.15	.13	.17	.17	.16	.14	.13	.12
1851	L	1.509	.307	.463	18,280	39,480	28,220	60,950	1.62	16.2	1.15×.19	.219	52.8	Silky	.22	.16	.13	.16	.15	.15	.15	.17	.17	.16
1852	C	1.503	.340	.511	19,750	38,650	31,120	60,900	1.38	13.8	1.16×.24	.278	45.5	do	.21	.17	.15	.13	.13	.12	.12	.13	.11	.11
1853	L	1.513	.311	.471	17,580	37,320	25,150	53,400	2.30	23.0	1.17×.18	.211	55.2	do	.29	.25	.24	.22	.21	.21	.22	.20	.24	.22
1854	C	1.510	.316	.477	16,760	35,140	27,570	57,800	2.48	24.8	1.11×.20	.222	53.4	do	*.64	.24	.24	.24	.15	.17	.14	.18	.24	.24
1855	L	1.512	.312	.472	15,400	32,630	24,820	52,580	1.77	17.7	1.09×.18	.196	58.4	do	.19	.20	.19	.18	.17	.16	.19	.16	.16	.17
1856	C	1.511	.315	.476	16,550	34,770	27,100	56,930	2.29	22.9	1.16×.19	.220	53.7	do	.22	.22	.23	*.52	.31	.18	.16	.16	.14	.15
1857	L	1.506	.301	.453	18,450	40,730	28,420	62,740	2.65	26.5	1.12×.20	.224	50.3	do	.26	.21	.28	*.63	.23	.21	.20	.19	.21	.23
1858	C	1.508	.328	.495	18,800	37,980	30,540	61,700	2.03	20.3	1.16×.22	.253	48.4	do	.19	*.83	*.43	.16	.17	.17	.15	.14	.15	.14
1859	L	1.505	.303	.459	18,950	41,290	26,980	58,780	2.63	26.3	1.15×.18	.207	54.9	Silky, slight lamination	.28	*.50	.27	.24	.23	.22	.22	.20	.20	.18
1860	C	1.498	.348	.521	19,200	36,850	31,190	59,870	2.11	21.1	1.25×.24	.300	42.4	Silky, seam ¼ inch long	*.52	.32	.24	.17	.15	.14	.16	.17	.12	.12
1861	L	1.516	.302	.458	19,800	43,220	27,500	60,040	2.34	23.4	1.18×.17	.201	56.1	Silky	.30	*.65	.27	.22	.18	.18	.15	.14	.12	.13
1862	C	1.498	.344	.515	19,750	38,350	31,550	61,260	2.11	21.1	1.12×.23	.258	49.9	do	*.56	.26	.19	.20	.20	.18	.16	.12	.12	.12
1863	L	1.502	.312	.469	18,280	38,980	27,480	58,500	2.89	28.9	1.08×.19	.205	56.2	do	.37	*.66	.25	.22	.23	.25	.24	.25	.21	.21
1864	C	1.504	.323	.486	20,200	41,560	29,100	59,880	2.09	20.9	1.12×.21	.235	51.6	do	.31	.53	.20	.18	.17	.15	.15	.13	.13	.14
1865	L	1.517	.290	.440	16,500	37,500	24,400	55,450	2.31	23.1	1.20×.18	.216	50.9	Silky, trace of lamination	.20	.27	*.62	.23	.17	.15	.17	.16	.16	.18
1866	C	1.517	.320	.485	19,950	41,130	28,980	59,750	1.77	17.7	1.29×.23	.297	38.7	Silky, stratified	.32	.19	.24	.16	.11	.14	.14	.14	.14	.19

* Indicates fractured section.

TENSILE TESTS OF CHAIN SPECIMENS FOR THE BUREAU OF EQUIPMENT AND RECRUITING, U. S. NAVY DEPARTMENT.

No. of test.	Marks.	Links.		Mark on studs.	Diameter of iron.	Sectional area of chain.	Tensile strength.		Fracture.	
		No.	Kind.				Total.	Per sq. inch.	Location.	Appearance.
					Inches.	*Sq. ins.*	*Pounds.*	*Pounds.*		
1907	A 2½	5	Studded.	U. S.—N. Y., W ...	2.12	7.06	289,600	41,020	End link in quarter weld in two places..	One-quarter weld granular 60 per cent.; fibrous 40 per cent. Opposite end opened at inside, showing granular metal.
1908	A 2½	5	...do	....do	2.08	6.80	274,200	40,320	First link at quarter weld	Fibrous 70 per cent.; granular 30 per cent.
1909	A 2	5	...do	....do	2.00	6.28	243,600	38,790	First link at weld.....	Granular 8 per cent.; following scarf 92 per cent.
1910	A 2	5	...do	....do	1.96	6.03	208,150	34,510	Second link at weld	Granular 10 per cent.; following scarf 90 per cent.
1911	A 2	5	...do	....do	1.98	6.16	223,300	36,250	.....do	Granular 10 per cent.
1912	A 1¾	5	...do	....do	1.68	4.43	132,100	29,820	End link, each quarter butt.....	Granular.
1913	A 1¾	5	...do	....do	1.73	4.70	186,000	39,570	First link at weld.....	Followed scarf 50 per cent.
1914	A 1¾	5	...do	....do	1.72	4.65	180,100	38,730	Third link at quarter weld	Fibrous.
1915	A 1⅝	5	...do	.. do	1.64	4.22	139,600	33,130	Second link at weld	Do.
1916	A 1⅝	5	...do	....do	1.61	4.07	152,600	37,493	First link at weld	Fibrous; slight granulation.
1917	A 1⅝	5	.. do	... do	1.60	4.02	165,600	41,190	Third link at weld.....	Followed scarf.
1918	A 1⅝	5	...do	....do	1.48	3.44	138,700	40,320	First link at weld.....	Followed scarf 40 per cent.; fibrous 60 per cent.
1919	A 1½	5	...do	....do	1.48	3.44	133,200	38,720	.....do	Fibrous.
1920	A 1½	5	...do	....do	1.48	3.44	145,400	42,270	.....do	Fibrous; slight granulation.
1921	A 1⅜	5	...do	....do	1.37	2.95	118,400	40,140	Third link at quarter weld.....	Fibrous.
1922	A 1⅜	5	...do	....do	1.38	2.99	125,950	42,120	Second link at quarter weld	Fibrous 95 per cent.; granular 5 per cent.
1923	A 1⅜	5	...do	....do	1.37	2.95	118,300	40,100	First link at weld.....	Granular 40 per cent.; followed weld 60 per cent.
1924	A 1¼	5	...do	....do	1.23	2.38	79,480	33,360	End link at side	Granular 10 per cent.; fibrous 90 per cent.
1925	A 1¼	5	...do	....do	1.22	2.34	91,300	39,870	Third link at quarter weld.....	Fibrous.
1926	A 1¼	5	...do	....do	1.24	2.42	94,200	38,930	Second link at weld	Followed scarf.
1927	A 1⅛	5	.. do	....do	1.12	1.97	76,800	38,980	.....do	Do.
1928	A 1⅛	5	...do	....do	1.12	1.97	87,500	44,420	First link at weld.....	Granular 40 per cent.; followed scarf 60 per cent.
1929	A 1⅛	5	...do	....do	1.11	1.94	82,400	42,470	.....do	Followed scarf.
1930	A 1	7	Plain....	.....	.98	1.51	64,250	42,550	First link at welded end	Fibrous.
1931	A 1	5	Studded	U. S.—N. Y., W ...	.98	1.51	61,150	40,500	Third link at quarter weld.....	Do.
1932	A 1	7	Plain....	.....	1.00	1.57	57,700	36,750	Second link at welded end	Do.
1933	A 1	5	Studded	U. S.—N. Y., W ...	.98	1.51	60,650	40,170	Second link at weld.....	Fibrous; followed weld in part.
1934	A 1	5	...do	....do	.98	1.51	60,500	40,070	.....do	Fibrous 50 per cent.; followed weld 50 per cent.
1935	A 1	7	Plain....	.....	1.00	1.57	64,900	41,349	First link at weld.....	Fibrous 60 per cent.; followed scarf 40 per cent.
1936	A ⅞	7	...do	.....	.86	1.16	53,420	46,050	..... do	Fibrous.
1937	A ⅞	7	...do	.....	.85	1.13	48,350	42,700	First link at quarter weld.....	Do.

1972	C 5	7	...do	...do	1.23	2.38	113,100	47,520	Second link at side	Do.
1973	D 2	5	...do	U.S.—N.Y., W	1.98	6.16	231,200	37,530	Third link at weld	Fibrous 95 per cent.; granular 5 per cent.
1974	D 1¾	5	...do	...do	1.72	4.65	186,880	40,190	Second link at weld	Fibrous.
1975	D 1½	5	...do	...do	1.49	3.49	131,080	37,560	First link at weld	Do.
1976	D 1¼	5	...do	...do	1.25	2.45	68,900	28,120	End link at weld	
1977	D 1⅛	5	...do	...do	1.12	1.97	63,050	32,010	First link at weld	Fibrous 50 per cent.; followed scarf 50 per cent.
1978	D ⅞	7	Plain		.86	1.16	52,350	45,130	Second link	Followed scarf.
1979	D ¾	9	...do		.75	.883	27,960	31,660	End link, ¾ inch diameter at weld	
1980	D ⅝	9	...do		.60	.565	25,380	44,920	First link at quarter weld	Fibrous.
1981	D ½	11	...do		.48	.262	15,920	43,980	Third link at quarter weld	Do.
1982	U.S. 35	5	Studded	U.S—N.Y., W	1.95	5.97	235,100	39,380	Second link at quarter weld	Fibrous; slight granulation.
1983	U.S. 33	5	...do	...do	1.71	4.59	173,400	37,780	Third link at weld	Followed scarf 40 per cent.
1984	U.S. 55	5	...do	...do	1.47	3.39	121,100	35,720	First link at weld	Fibrous.
1985	U.S. 44	5	...do	...do	1.24	2.42	89,700	37,070	...do	Fibrous 40 per cent.; followed scarf 60 per cent.
1986	U.S. 8	5	...do	...do	1.12	1.97	69,500	35,280	Second link at weld	Followed scarf.
1987	U.S. 88	5	...do	...do	.98	1.51	61,060	40,440	First link at weld	Do.
1988	U.S. 7	7	Plain		.88	1.22	46,600	38,200	Second link at quarter weld	Fibrous.
1989	U.S. 4	7	...do		.73	.837	39,100	46,710	Middle link at weld	Do.
1990	U.S. 5	9	...do		.60	.565	15,450	27,350	First link at weld	Fibrous; spongy.
1991	U.S. 11	11	...do		.48	.362	15,350	42,400	Fourth link at weld	Fibrous.
1992	D.B.G. 44	5	Studded	Bradlee & Co., Philadelphia.	1.98	6.16	211,500	34,330	Middle link at side	Fibrous 90 per cent.; granular 10 per cent.
1993	D.B.G. 13	7	...do	...do	1.70	4.54	164,200	36,170	Third link at quarter weld	Fibrous 75 per cent.
1994	D.B.G. 33	9	...do	...do	1.44	3.26	124,400	38,160	First link at side	Fibrous 90 per cent.
1995	D.B.G. 14	11	...do	...do	1.23	2.38	74,500	31,300	Third link at weld	Fibrous 95 per cent.; granular 5 per cent.
1996	D.B.G. 18	11	...do		1.10	1.90	76,500	40,260	First link at weld	Fibrous.
1997	D.B.G. 8	13	...do		.98	1.51	54,200	35,890	Fourth link at weld	Do.
1998	D.B.G. 7	13	...do		.85	1.13	47,800	42,300	Sixth link at quarter weld	Do.
1999	D.B.G. 3	21	Plain		.74	.860	37,300	43,370	Fifth link at weld	
2000	D.B.G. 5	25	...do		.61	.584	25,100	42,980	Seventh link at weld	Do.
2001	D.B.G. 4	32	...do		.48	.362	12,100	33,430	Fourteenth link at weld	Do.
2002	44	5	Studded	Bradlee & Co., Philadelphia.	1.96	6.03	188,600	31,280	End link at each quarter butt	One side granular; one side granular 50 per cent.
2003	13	7	...do	...do	1.74	4.76	145,400	30,550	First link each side of welded end	Granular.
2004	33	9	...do	...do	1.50	3.53	119,900	33,970	Second link at weld	Fibrous.
2005	14	11	...do	...do	1.27	2.53	97,200	38,420	Fifth link at weld	Fibrous 95 per cent.; granular 5 per cent.
2006	18	11	...do	...do	1.12	1.97	83,300	42,280	First link at side at end of weld	Fibrous.
2007	8	13	...do		.98	1.51	59,800	39,600	Seventh link at side at end of scarf	Do.
2008	8	17	Plain		.82	1.06	143,200	40,750	Seventh link at weld	Do.
2009	7	13	Studded		.84	1.11	47,700	42,970	...do	Do.
2010	3	21	Plain		.75	.883	42,300	47,900	Sixth link at quarter weld	Fibrous 30 per cent.; granular 70 per cent.
2011	5	25	...do		.65	.664	20,100	30,270	First link at weld	Fibrous.
2012	4	35	...do		.48	.362	14,300	39,500	Fifth link at quarter weld	Do.
2013		15	...do		.82	1.06	31,400	29,620	Seventh link at weld	Do.
2014		17	...do		.67	.705	20,300	28,790	Fifth link at weld	Fibrous 50 per cent.; imperfect 50 per cent.
2015		19	...do		.62	.604	17,300	28,640	Ninth link at weld	Fibrous.
2016		21	...do		.54	.458	13,900	30,350	Eighth link at weld	Do.

TENSILE TESTS OF CHAIN SPECIMENS FOR THE BUREAU OF EQUIPMENT AND RECRUITING, ETC.—Continued.

No. of test.	Marks.	Links.		Mark on studs.	Diameter of iron.	Sectional area of chain.	Tensile strength.		Fracture.	
		No.	Kind.				Total.	Per sq. inch.	Location.	Appearance.
					Inches.	*Sq. in.*	*Pounds.*	*Pounds.*		
2017	.....	25	Plain....	.....	.49	.377	13,200	35,010	Second link at weld.....	Fibrous.
2018	.....	31	... do....	.....	.42	.277	9,600	34,660	Link next to end link at weld; diameter, .47 inch	Do.
2019	.....	37	... do....	.....	.36	.203	7,800	38,420	Second link at weld.....	Do.

The links of the chain in set C have enlarged cross-sections at ends as follows:
Links 2″ diameter at sides have ends 2″.25 to 2″.37 diameter.
Links $1\frac{7}{8}$″ diameter at sides have ends 2″.22 diameter.
Links $1\frac{1}{2}$″ diameter at sides have ends 1″.83 diameter.
Links $1\frac{1}{4}$″ diameter at sides have ends 1″.47 to 1″.50 diameter.

TENSILE TESTS OF WROUGHT-IRON BARS REPRESENTING THE MATERIAL FROM WHICH SOME OF THE CHAINS WERE MADE WHICH WERE TESTED FOR THE NAVY DEPARTMENT.

No. of test.	Mark on specimen.	Diameter.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Nominal.	Actual.		Total.	Per square inch.	Total.	Per square inch.			Diameter.	Area.												
		Inches.	*Inches.*	*Sq. ins.*	*Pounds*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*Per cent.*	*Inches.*	*Sq. ins.*	*Per cent.*		"	"	"	"	"	"	"	"	"	"
1885	A	1 7/8	1.895	2.820	93,300	33,090	150,700	53,440	2.30	23.0	1.57	1.936	31.3	Fibrous...	.21	.21	.21	.23	.22	.21	.22	.22	.25	.32
1886	A	1 1/4	1.728	2.345	69,600	29,680	121,800	51,940	3.30	33.0	1.27	1.267	45.9	...do.....	.25	.25	.24	.25	.27	.32	*.72	.44	.30	.26
1887	A	1 1/2	1.505	1.779	62,200	34,960	94,680	53,220	2.89	28.9	1.15	1.039	41.6	...do.....	.22	.24	.24	.24	*.44	*.57	.25	.21	.23	.25
1888	A	1 3/8	1.385	1.506	54,900	36,450	80,600	53,520	2.73	27.3	1.11	.968	35.7	...do.....	.22	.23	.23	.27	.24	.22	.23	.25	.31	*.53
1889	A	1 1/4	1.235	1.237	45,950	37,150	66,610	53,850	2.85	28.5	1.00	.785	36.5	...do.....	*.59	.33	.26	.24	.24	.24	.24	.23	.23	.25
1890	A	1 1/8	1.140	1.021	40,900	40,060	55,720	54,570	2.34	23.4	.89	.622	39.1	...do.....	.25	.23	.22	.23	.25	.22	.25	.24	.22	.23
1891	A	7/8	.880	.608	26,750	44,000	32,900	54,210	2.40	24.0	.65	.332	45.4	...do.....	.22	.20	.18	.29	*.51	.20	.20	.20	.20	.20
1892	D	1 1/4	1.275	1.277	44,400	34,770	63,810	49,970	2.29	22.9	1.03	.833	34.8	...do.....	.33	.24	.23	.22	.22	.19	.19	.20	.22	.25
1893	D	1 1/8	1.128	.999	37,400	37,440	53,090	53,140	2.56	25.6	.88	.608	39.1	...do.....	.35	.26	*.48	.21	.20	.20	.21	.24	.22	.19
1894	D	1 1/8	1.130	1.003	37,350	37,240	53,100	52,940	2.50	25.0	.88	.608	39.4	...do.....	.22	.23	.22	.20	.21	.24	*.51	.27	.20	.20
1895	D	7/8	.880	.608	25,800	41,610	32,480	53,430	1.61	16.1	.76	.454	25.3	...do.....	.21	*.27	.13	.16	.14	.14	.14	.14	.15	.13
1896	D	7/8	.880	.608	24,980	41,090	32,540	53,520	2.52	25.2	.70	.385	36.7	...do.....	.22	*.48	.24	.23	.21	.21	.21	.25	.25	.22
1897	D	5/8	.620	.302	12,800	42,380	16,400	54,300	2.55	25.5	.47	.173	42.7	...do.....	.21	.20	.21	.22	.23	.22	.24	*.46	.31	.25
1898	D	1/2	.500	.196	7,780	39,690	9,920	50,610	2.23	23.3	.40	.126	35.7	...do.....	.19	.21	.24	.22	.22	.24	*.39	.21	.19	.22
1899	D	1/2	.500	.196	8,150	41,580	10,600	54,080	1.94	19.4	.39	.119	39.2	...do.....	.18	.19	.20	.18	.20	.20	.19	.19	.22	.19
1900	44	1 1/4	1.252	1.231	41,150	33,430	62,530	50,800	2.86	28.6	1.00	.785	36.2	...do.....	*.35	*.48	.26	.22	.25	.29	.27	.25	.23	.26
1901	8	1 1/8	1.120	.985	34,700	35,230	51,660	52,450	2.06	20.6	.86	.581	41.0	...do.....	.26	.22	.20	.22	.20	.21	.19	.19	.19	.18
1902	8	1 1/8	1.120	.985	34,680	35,210	51,450	52,220	2.62	26.2	.86	.581	41.0	...do.....	.28	*.53	.37	.24	.21	.19	.20	.19	.19	.22
1903	88	1	1.000	.785	28,250	35,990	40,760	51,920	2.75	27.5	.77	.466	40.6	...do.....	.25	.25	*.55	.30	.25	.24	.23	.24	.21	.23
1904	88	1	1.000	.785	28,500	36,310	40,780	51,950	2.77	27.7	.75	.442	43.7	...do.....	.21	.21	.23	.23	.26	*.56	.30	.27	.23	.27
1905	7	7/8	.880	.608	24,950	41,040	32,360	53,220	2.19	21.9	.70	.385	36.7	...do.....	.25	*.38	.19	.19	.21	.20	.19	.20	.19	.19
1906	5	5/8	.620	.302	12,900	42,720	16,380	54,240	2.29	22.9	.49	.189	37.4	...do.....	*.40	.25	.23	.22	.21	.21	.20	.18	.18	.21

Where * is not shown in elongation of inch sections, fracture occurred outside the gauged section.

RUNNERS OF STEEL CASTINGS RECEIVED FROM COMMODORE S. R. LUCE, U. S. NAVY.

No. 1174.

Diameter, ″.504.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000133	.000133	0.	.....	
2,000	10,000	.000333	.000200	0.	.....	
3,000	15,000	.000500	.000167	0.	.....	
4,000	20,000	.000667	.000167	.000067	.000067	
5,000	25,000	.000867	.000200	.000067	0.	
6,000	30,000	.001033	.000166	.000067	0.	
6,200	31,000	.001067	.000034	.....	.....	
6,400	32,000	.001133	.000066	.....	.....	
6,600	33,000	.001167	.000034	.....	.....	
6,800	34,000	.001233	.000066	.....	.....	
7,000	35,000	.001300	.000067	.000233	.000166	
7,200	36,000	.001400	.000100	.....	.....	
7,400	37,000	.001500	.000100	.....	.....	
7,600	38,000	.001567	.000067	.....	.....	
7,800	39,000	.001667	.000100	.....	.....	
8,000	40,000	.001833	.000166	.000500	.000267	
8,200	41,000	.002000	.000167	.....	.....	
8,400	42,000	.002100	.000100	.....	.....	
8,600	43,000	.002233	.000133	.....	.....	
8,800	44,000	.002433	.000200	.....	.....	
9,000	45,000	.002767	.000334	.001167	.000667	
9,200	46,000	.003000	.000233	.....	.....	
9,400	47,000	.003233	.000233	.....	.....	
9,600	48,000	.003500	.000267	.....	.....	
9,800	49,000	.003867	.000367	.....	.....	
10,000	50,000	.004333	.000466	.002533	.001366	
11,000	55,000	.0067	.002367	.....	.....	
12,000	60,000	.0100	.0033	.....	.....	
13,000	65,000	.0133	.0033	.....	.....	
14,000	70,000	.0167	.0034	.....	.....	
15,000	75,000	.0217	.0050	.....	.....	
16,000	80,000	.0250	.0033	.....	.....	
17,000	85,000	.0333	.0083	.....	.....	
18,000	90,000	.0400	.0067	.....	.....	
18,560	92,800	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	92,800
Elastic limit per square inch of original section about	do	35,000
Elongation per inch after rupture	inch	0.0400
Reduction in diameter at point of rupture	do	.014
Reduction in area after rupture, per centum of original section		5.7
Position of rupture		″.80 from neck.
Character of broken surface		granular, dull-colored spot near center.
Elongation of inch sections		″.06*, ″.04, ″.02

COMPRESSION OF VARIOUS SUBSTANCES

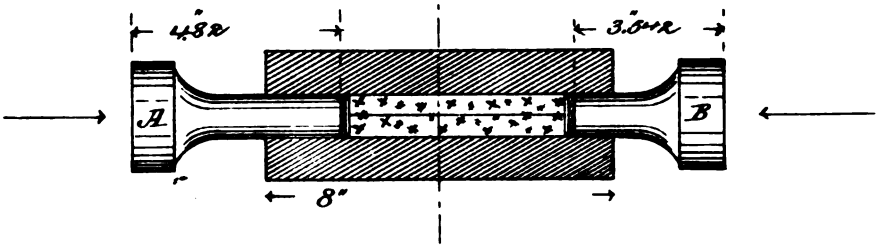
FOR THE

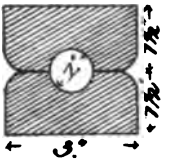
U. S. GEOLOGICAL SURVEY.

MATERIAL CONFINED IN CYLINDER WITH CLOSED ENDS.

1755

Sketch of retaining cylinder and pistons.





H Ex 31 49 2

No. 680.

Test lead, granulated, C. P.

Cylinder charged with paper-covered cartridge of 7,810 grains weight.

Applied loads.		Length of lead column.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches.*	
0	0	6.82	
1,000	1,273	5.48	
5,000	2,546	4.85	
8,000	6,366	4.62	
8,000	10,186	4.27	
10,000	12,732	4.05	
12,000	15,278	3.91	
14,000	17,825	3.84	

Stroke of plunger A exhausted.

Plunger withdrawn and additional material placed in the cylinder. (Copper checks over ends of original cartridge remaining in the cylinder.)

Loads again applied.

Applied loads.		Length of lead column.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches*	
1,000	1,273	6.57	
2,000	2,546	5.95	
3,000	3,820	5.74	
4,000	5,093	5.61	
5,000	6,366	5.51	
8,000	10,186	5.39	
10,000	12,732	5.36	
12,000	15,278	5.35	
14,000	17,825	5.35	
20,000	25,464	5.31	
25,000	31,830	5.19	
30,000	38,196	5.17	
40,000	50,928	5.14	
50,000	63,660	5.11	
60,000	76,392	5.10	
70,683	90,000	5.06	
76,000	96,766	5.03 5.02	After sustaining the pressure 2 minutes.

Cylinder opened and lead found to be in a coherent mass, but not welded or fused.

Lead column easily broken transversely, grains crumble off the fractured ends.

No. 681.

Antimony (commercial) ground to pass through sieve 2,304 meshes per square inch. Wire of sieve, ".006 diameter.

Quantity in cartridge, 4,710 grains weight.

Applied loads.		Length of antimony column.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches.*	
2,000	2,546	5.64	
3,000	3,820	5.57	
4,000	5,093	5.46	
5,000	6,366	5.37	
6,000	7,639	5.28	
7,000	8,912	5.20	
8,000	10,186	5.13	
10,000	12,732	5.01	
12,000	15,278	4.92	
14,000	17,825	4.84	
16,000	20,371	4.76	
20,000	25,464	4.63	
25,000	31,830	4.50	
30,000	38,196	4.40	
40,000	50,928	4.23	
50,000	63,660	4.10	
60,000	76,392	3.98	
70,686	90,000	3.91	
76,000	96,766	3.87	

Material compressed into a coherent mass of low tenacity.

No. 682.

Calcite, powdered.

Quantity in cartridge, 1,900 grains weight.

Applied loads.		Length of calcite column.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches.*	
3,000	3,820	5.35	Initial load.
4,000	5,093	5.05	
5,000	6,366	4.91	
6,000	7,639	4.74	
7,000	8,912	4.68	
8,000	10,186	4.59	
10,000	12,732	4.48	
12,000	15,278	4.40	
14,400	17,825	4.35	
16,000	20,371	4.30	
20,000	25,464	4.23	
25,000	31,830	4.14	
30,000	38,196	4.06	
40,000	50,928	4.01	
50,000	63,660	3.94	
60,000	76,392	3.88	
70,686	90,000	3.83	
76,000	96,766	3.80	

Material compressed into a coherent mass of low tenacity.

No. 683.

Charged cylinder with substances in the following order, from north to south ends:

1.

Antimony, powdered, in paper cartridge case. with open end (previously compressed).

2.

A—Wax.

3.

Paraffine.

4.

Bismuth, powdered, in paper cartridge case, with closed ends.

5.

B—Paraffine.

6.

Lead, in paper cartridge case, with open end (previously compressed).

On wax A was laid a silver 3-cent piece, and a wire staple pressed into the upper side. On paraffine B a coin and staple were similarly placed.

7,600 pounds = 96,766 pounds per square inch was applied and sustained a period of five minutes.

Upon opening the cylinder the above substances were found in the same relative order as when first introduced. The coins and staples remained at the upper side of the column; the coins were bent to the curvature of the cylinder, and were pressed against the upper half of the cylinder with such force as to leave an impression of their relief work on the wall of the cylinder. Coin B rested in part upon the lead and in part upon the paraffine.

No. 684.

Cylinder charged as follows:

Material in cartridges with paper covering, closed ends.

	Grains.
Chloride of potassium (KCl)	360
Chloride of sodium (NaCl)	500
Sulphur (S)	400
Chloride of ammonium (NH_4Cl)	300

These substances were submitted to a pressure of 76,000 pounds on piston = 96,766 pounds per square inch, and remained under pressure five minutes.

When removed from the testing machine, the sulphur, chlorides of potassium and sodium were found in coherent masses, not fused. The chloride of ammonium somewhat resembled paraffine in appearance; when broken, however, was flaky at fractured surface.

No. 685.

Cylinder charged with the following substances in paper-covered cartridges:

	Grains.
Carbonate of soda, dry (Na_2CO_3)	500
Sulphate of soda ($NaSO_4$)	560
Sulphate of zinc ($ZnSO_4$)	500
Sulphate of copper ($CuSO_4$)	460

Under 50,000 pounds (total) compression leakage of the cylinder began. Vapor from $NaSO_4$ escaped through the joint of the halves of the cylinder.

Rapidly increasing the pressure 76,000 pounds = 96,700 pounds per square inch was reached, water continuing to escape.

Removed from the cylinder, Na_2CO_3 was reduced to a compact mass. $NaSO_4$ had parted with its water. $ZnSO_4$ and $CuSO_4$ were apparently unchanged otherwise than pressed into coherent masses. The sulphate of copper could be reduced by pressure of the hands to the pulverized condition it was in before testing.

No. 586.

Cylinder now charged with the following substances in paper-covered cartridges:

	Grains.
Glass, powdered	500
Resin	230
Zinc and sulphur	800
Borax	300

The glass was apparently unaffected by the pressure of 76,000 pounds = 96,766 pounds per square inch; it was loose powder afterward.

The other substances were pressed into coherent masses, the zinc and sulphur remaining in a state of mechanical mixture.

TESTS MADE FOR PRIVATE PARTIES FROM JULY 1, 1885, TO JUNE 30, 1886.

Date.		Material.	For whom tested.		
			Name.	City.	State.
1885.					
July	3	9 cubes terra-cotta	Boston Terra-Cotta Company	Boston	Mass.
	7	1 cube stone	Norcross Brothers	do	Mass.
	13	Car couplers	McConway & Torley	Pittsburgh	Pa.
	13	3 wrought-iron stay bolts	Schenectady Locomotive Works	Schenectady	N. Y.
	18	2 pieces steel plate	William Allen & Sons	Worcester	Mass.
	18	4 pieces steel plate	Park Brother & Co	Pittsburgh	Pa.
	22	Wrought-iron bar	Putnam Machine Company	Fitchburg	Mass.
	30	4 cubes terra-cotta	Cyrus L. W. Eidlitz	New York	N. Y.
	31	do	Boston Terra-Cotta Company	Boston	Mass.
	31	4 cubes granite	Keene Granite Company	do	Mass.
Aug.	3	1 bar wrought-iron	Prof. Thomas Egleston	New York	N. Y.
	4	do	do	do	N. Y.
	4	1 bar steel	do	do	N. Y.
	4	8 pieces steel plate	Robinson Boiler Works	Boston	Mass.
	4	6 riveted joints	do	do	Mass.
	4	2 wrought-iron links	Kinsley Iron and Machine Company.	Canton	Mass.
	21	Cast-iron gear tooth	William A. Harris	Providence	R. I.
	24	12 cubes terra-cotta	Boston Terra-Cotta Company	Boston	Mass.
	31	3 pieces steel	Pennsylvania Railroad	Altoona	Pa.
Sept.	1	1 piece steel	do	do	Pa.
	1	3 railroad spikes	J. Bradford	Chelsea	Mass.
	7	2 steel hooks	Charles Schryzer, agent	Kansas City	Mo.
	28	2 pieces wire rope	Metallic Splice Manufacturing Company.	Boston	Mass.
Oct.	14	8 pieces rope	Standard Cordage Company	do	Mass.
	14	2 railroad spikes	J. G. Low	Chelsea	Mass.
Dec.	26	2 pieces steel plate	I. P. Morris & Co	Philadelphia	Pa.
	26	6 castings	Golding & Co	Boston	Mass.
1886.					
Jan.	6	2 cubes sandstone	Norcross Brothers	do	Mass.
	6	3 specimens wrought-iron	Wheeler Metal Company	do	Mass.
	7	9 pieces rope	Standard Cordage Company	do	Mass.
	7	18 pieces sheeting	James A. Tilden	do	Mass.
	8	1 piece aluminum bronze	South Boston Iron Works	South Boston	Mass.
	27	1 piece steel plate	Lloyd & Symes	Boston	Mass.
	28	4 pieces copper wire	D. H. Bishop	do	Mass.
Feb.	25	2 pieces oriental metal	Oriental Metal Company	do	Mass.
	26	10 pieces aluminum bronze	Cowles E. S. & Aluminum Company.	Cleveland	Ohio.
	27	4 pieces aluminum bronze	do	do	Ohio.
Mar.	18	2 steel angle bars	Missouri Pacific Railway	Athens	Pa.
	19	do	do	do	Pa.
	19	Wire-rope clutch	F. P. Canfield	Boston	Mass.
	19	1 bar wrought-iron	Concord Axle Company	Penacook	N. H.
	19	3 pieces steel plate	Lloyd & Symes	Boston	Mass.
	19	do	Rhode Island Locomotive Works	Providence	R. I.
	20	9 pieces steel plate	R binson Boiler Works	Boston	Mass.
	20	3 riveted joints	Rhode Island Locomotive Works	Providence	R. I.
	20	11 riveted joints	Robinson Boiler Works	Boston	Mass.
	22	4 pieces steel plate	Pennsylvania Railroad	Altoona	Pa.
	27	1 riveted joint	do	do	Pa.
	29	3 riveted joints	do	do	Pa.
	30	do	do	do	Pa.
	31	5 riveted joints	do	do	Pa.
Apr.	1	4 riveted joints	do	do	Pa.
	1	6 riveted joints	H. S. Robinson	Boston	Mass.
	1	4 pieces steel plate	do	do	Mass.
	8	4 bricks	Fred. Pope	do	Mass.
	9	1 latticed column	Kentucky and Indiana Bridge Company.	Louisville	Ky.
	10	do	do	do	Ky.
	12	do	Saint Paul and Northern Pacific Railway Company.	Minneapolis	Minn.
	13	do	do	do	Minn.
	14	do	do	do	Minn.
	17	2 steel eye-bars	Dominion Bridge Company	Montreal	P. Q.
	23	3 steel eye-bars	do	do	P. Q.
	26	do	do	do	P. Q.
	28	1 steel eye-bar	do	do	P. Q.
		2 pieces steel	do	do	P. Q.
	27	2 steel eye-bars	Saint Paul and Northern Pacific Railway Company.	Minneapolis	Minn.
	28	1 steel eye-bar	do	do	Minn.
June	9	1 cube stone	Roxbury Stone Company	Boston	Mass.

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